PRODUCTS finishing

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TECHNICAL SERVICE on request

THE COWLES DETERGENT CO.
METAL CLEANER DEPT.
7016 EUCLID AVENUE • CLEVELAND 3, OHIO

Products finishing

Horror

There sits a demon on the rack,
With eyes of red and soul of black,
Who checks each part as it goes through
And says, "That's mine; this one's for you."

His beady eyes and pointed ears
Miss nothing that he sees or hears,
For after he's received his count
He tries to get the whole amount.

He's out to gyp and cheat and trick,
To leave the worst and take his pick;
His wicked, scheming, plotting brain
Is half uncanny, half insane.

His learing lips make whooshing sounds
As tank by tank he makes his rounds,
Abusing, cursing, menacing—
Alert to ruin everything.

And when he's done and had his fun
He howls, and takes it on the run;
But he'll be back, as demons must,
For this one's evil name is Rust.

Metal Finishing at Toledo's DeVilbiss Company

By BRYANT W. POCOCK

MOST of us are fairly familiar with atomizers and spray guns. A few of us have stopped at one time or another to consider how they are made, or what makes them work. A very few of us are aware that the plating requirements for medicinal atomizers are among the most rigid in the world. These instruments, when we stop to realize it, are subjected not only to the common types of routine factory chemicals but more particularly to that vast assortment of special drugs, medicaments and vehicles whose effects upon all metals with which they come in contact must be taken into strict account. Physicians' atomizers, moreover, must resist the action of blood, serum, enzymes and other body fluids; hence the particulars of their finish coat assume the utmost importance.

As is well known, metals commonly deposited by electroplating vary in their reactions with chemicals either alone or in solution, and either singly or in mixtures. Chromium, for example, is highly inert or corrosion-resistant as long as its surface is protected by a microscopic film of chromium oxide. If anything such as contact with acid removes the oxide, however, the chrome plate becomes active and may corrode rapidly. Cadmium and zinc offer excellent protection under certain conditions, yet under others they are worthless. Neither is of much value in acid solutions, and zinc, being amphoteric, is subject to corrosion in basic or caustic environment. Cadmium, moreover, is poisonous and its use has been outlawed for many applications. Gold is resistant to tarnish and to attack by most chemicals; it is, however, a soft metal. Silver tarnishes in the presence of sulfur compounds but is not oxidized by oxygen when cold. It is readily attacked by nitric acid. Platinum is very inactive chemically but condenses oxygen upon its surface and occludes hydrogen. It is attacked by aqua regia, to which rhodium, a harder metal, is resistant. Platinum has about the same coefficient of expansion as glass. Tin offers good corrosion protection, but when tin plate is damaged the tin will accelerate rusting of iron. Nickel will oxidize when cold in moist air.

It is therefore a matter requiring considerable judgement and knowledge of metallurgical and physiological chemistry to make a wise and sound choice of metal to be plated as a finish coat on medicinal atomizers. Selection is likewise limited in the case of sprays for special chemicals such as insecticides, fungicides,

The spray gun illustrated above is the production type currently manufactured by the DeVilbiss Company

lacquers, and so on. Each case must be carefully and individually examined before a final choice is made. Metals commonly electrodeposited at DeVilbiss include gold, silver, rhodium, tin, cadmium, zinc, nickel, copper and chromium.

Gold is frequently plated on medicinal atomizers or their parts because of its excellent corrosion resistance. There are, however, some pharmaceuticals such as penicillin which deteriorate on contact with metals, and for these the Dow plastic Saran is used. Inasmuch as experience at DeVilbiss has shown that Saran is quite abrasive on tools, all tools used for machining this material are hard chromium plated. The DeVilbiss Company is a very large consumer of gold. The conventional cyanide bath is used, and a special unit has been designed and placed in operation for the barrel plating of this metal on a tremendous volume of small parts. The tumbler is of Bakelite and Lucite, which were the only satisfactory materials available when it was constructed, although it is felt at DeVilbiss that Saran would be an ideal material for this purpose. The tanks are lined with Tygon.

Originally, porcelain-coated steel tanks were used in the setup for gold. These were replaced by chemical stoneware, but even the stoneware eventually cracked under the stresses and strains produced by the temperatures used. Tygon, however, has held up in a satisfactory manner. Rebuilt Hanson-Van Winkle-Munning barrels are in use.

Gold fulminate for the bath is made in the DeVilbiss laboratory by the reaction of gold with aqua regia. The fulminate is washed and neutralized and is handled in wicker-covered one-gallon glass containers.

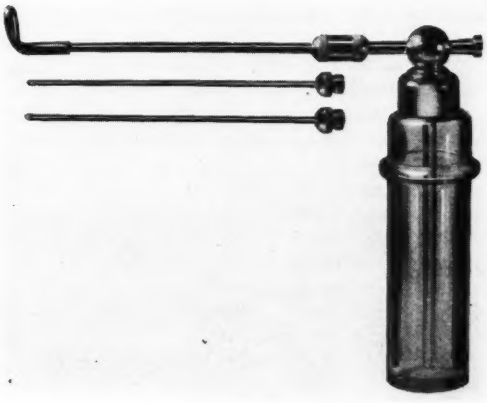
Rhodium is plated at DeVilbiss in those cases where chemical inertness and corrosion resistance must match those of gold, but where a white finish is required. As noted by K. Schumpelt (1) the importance of rhodium (in the electroplating field) arises not only from the ease with which it is deposited, but also from its high reflectivity. The conventional sulfate rhodium bath is used at DeVilbiss, where experience has served

(1) Schumpelt, K. (Baker & Co., Inc., Newark, N. J.), "Electrodeposition of the Metals of the Platinum Group," p. 283, *Resumen del articulo*, "Modern Electroplating," Special Volume, The Electrochemical Society, Columbia University, N. Y., 1942.

(2) McKay, Robert J., and Worthington, Robert, "Corrosion Resistance of Metals and Alloys," American Chemical Society Monograph Series No. 71, p. 182, Reinhold Publishing Corporation, New York, 1936.

(3) Ibid., p. 100.

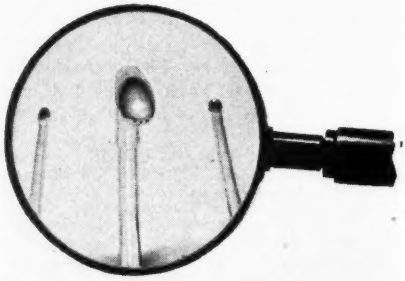
(4) Stewart, Wm. C., (Technical Adviser, American Institute of Bolt, Nut, and Rivet Manufacturers), An Address Before the Institute: "Nut Thread Tolerances and Gaging," Cleveland, Ohio, March 23, 1939.



No. 156SL atomizer and tubes manufactured by DeVilbiss

to emphasize the necessity for a clean solution free of all impurities. Extreme care is considered essential in assuring that the initial rinse is thorough and complete.

Palladium has been plated experimentally at DeVilbiss, but difficulties were experienced which were traced to the action of small holes and capillaries of atomizer parts in trapping liquids from preceding operations. These produced impurities when electrolyzed in the palladium bath. It was



Enlarged view of tip of tube of atomizer made by DeVilbiss showing three holes which must be hand cleaned by special piano wire held in pin vise during finishing. The tube is chromium plated.

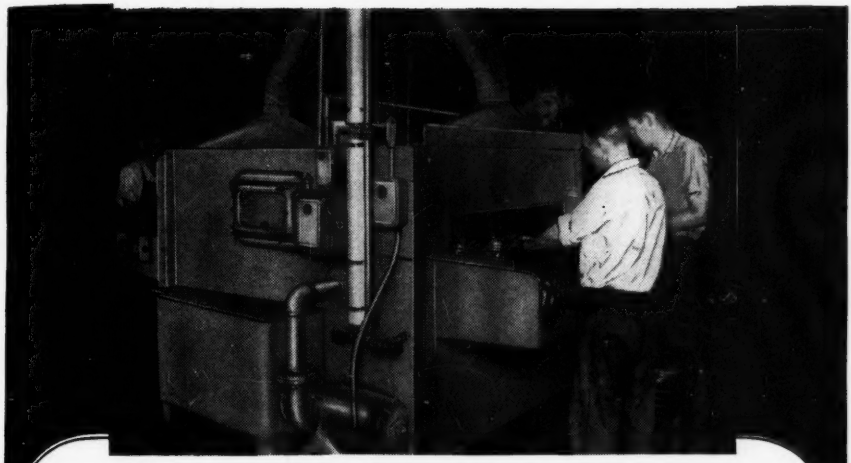
found that exceedingly minute traces of cyanide caused immense trouble. Plating with palladium was discontinued for these reasons, although both palladium and platinum are more abundant metals than rhodium.

Silver, because of its selective resistance to certain drugs and chemicals, is plated on some medicinal atomizer parts. Barrel plating is done, using the conventional potassium cyanide bath. The base stock, as is true of most small parts at DeVilbiss, is the so-called free-machining brass, which is a 70-30 copper-zinc alloy containing 3 per cent lead.

Tin is plated at DeVilbiss from the acid sulfate bath. Here again, selective corrosion resistance is the ultimate criterion which determines its use. Because of the widespread use of tin cans as containers for all sorts of foodstuffs, probably more data exist on the corrosion resistance of tin in the presence of both organic and inorganic chemicals than can be found in the case of any other metal. For example, it is known (2) that although tin is only 2 per cent as affected by Delicious apples as iron is, tin is attacked by rhubarb two-thirds as rapidly as iron. It is well known that tin is porous and hastens rusting of iron by contact in the case of damaged tin plate. In fact, when aerated (3), tin may corrode as rapidly as iron in the 5 per cent solutions of non-oxidizing acids such as sulfuric or acetic. Nevertheless, under conditions where polarization by hydrogen occurs, corrosion is prevented. Tin has excellent resistance to waters, as illustrated by its widespread use in equipment handling distilled water. It is plated at DeVilbiss in the case of special spraying applications on equipment used in the food and drug industry and also on pan-greasing machinery manufactured by the DeVilbiss Company for large commercial bakeries.

Large quantities of zinc are plated from the sodium cyanide bath at DeVilbiss, where considerable success has been realized in producing decorative as well as protective zinc coatings. Both still and barrel plating are used for zinc, and a pure zinc deposit bright dipped to high luster in a chromate bath leaves a tarnish and corrosion-resistant coating. Cadmium is plated occasionally, most cadmium being substituted by zinc during the war. The following steps are followed in plating with zinc:

1. Soak at 180 deg. F., using Northwest No. 20 and No. 45 cleaners to soften dirt, buffing compounds, etc.



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• This A-F Cleaning Unit is used to wash the sticky, gummy lubricant from stampings, which must be thoro-cleaned before assembly into other parts.

The stampings are carried through the Unit on an A-F Wire Mesh Conveyor. This type of conveyor permits the powerful A-F Super-Spray System to wash *all four sides* of the stampings at the same time. Every inch of surface is thoro-cleaned quickly, efficiently, economically!

If you make metal parts or products, you have a cleaning and finishing problem. Why not discuss it with A-F Cleaning and Finishing Engineers? If one of our standard units will not do the job, remember that A-F Engineers are specialists in custom-built equipment that insures faster production and higher product quality at lowest cost. Write today.

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CONVEYING MACHINERY A-F **Alvey-Ferguson**

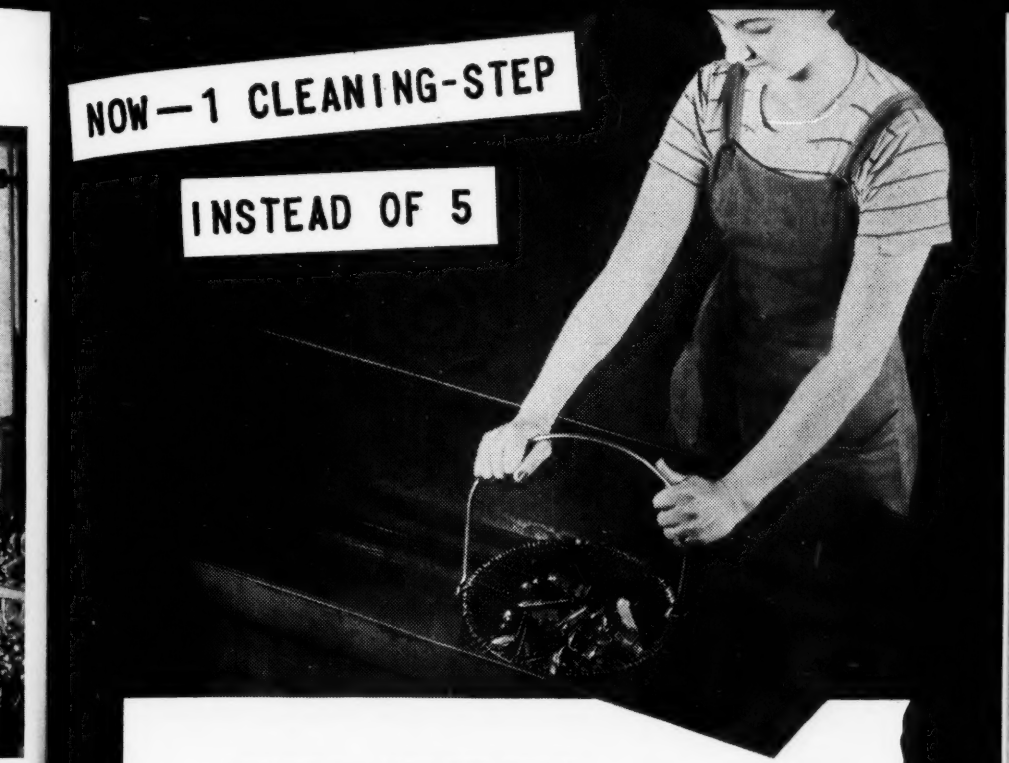
View of the electroplating department at the DeVilbiss Company showing in particular the care with which parts are handled

2. Electrolytic cleaning at 212 deg. F. with Northwest No. 30 cleaner.
3. Cold water rinse.
4. Acid dip in 10 per cent HCl at room temperature.
5. Cold water rinse.
6. Zinc plating. Du Pont's zinc cyanide bath is used, which produces a deposit of pure zinc. Impurities are precipitated from this bath at regular intervals by additions of sodium sulfide, Na_2S.
7. Cold water rinse.
8. Bright dip.
9. Cold water rinse, air agitated.
10. Cold water rinse, air agitated.
11. Final chromate bright dip.
12. Thorough cold water rinse.
13. Thorough hot water rinse.
14. Centrifugal drying.

Copper, being a critical material during the war, has been plated only in light volume at DeVilbiss. The conventional cyanide bath is used.

When nickel is specified as a finish, the bright nickel bath of the Harshaw Chemical Company is used, both for corrosion resistance and for decorative finish. Some parts, of course, require greater thicknesses of plate than others. All fittings which are nickel plated are of the Class 3 type. This type of fitting is defined (4) by the American Standard for Screw Threads, A.S.A. B1. 1-1935 as follows:

"Class 3 represents an exceptionally high grade of . . . threaded product and is recommended only in cases where the high cost of precision tools



SUN SPIRITS . . . Degreases and Cleans Small Parts; Replaces Expensive 5-Step Process

An eastern manufacturer cut the cost of degreasing and cleaning small parts in half when he started using Sun Spirits.

Costly equipment, including lead tanks, rubber shoes and gloves, etc., was formerly used in a complicated finishing process.

A Sun Engineer recommended a simple, fast cleansing in Sun Spirits, and, as a result, all the former chemicals were eliminated.

Five operations were replaced with one, and total estimated savings in labor, materials, time, and equipment were equal to one-half of the previous costs.

The fast, spotless cleaning now being obtained in this plant is typical of the performance of Sun Spirits in cleaning parts and machines in hundreds of plants. To remove oily, greasy films cleanly, quickly, and safely, call the Sun Engineer near you, or write . . .

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and continual checking of tools and product is warranted."

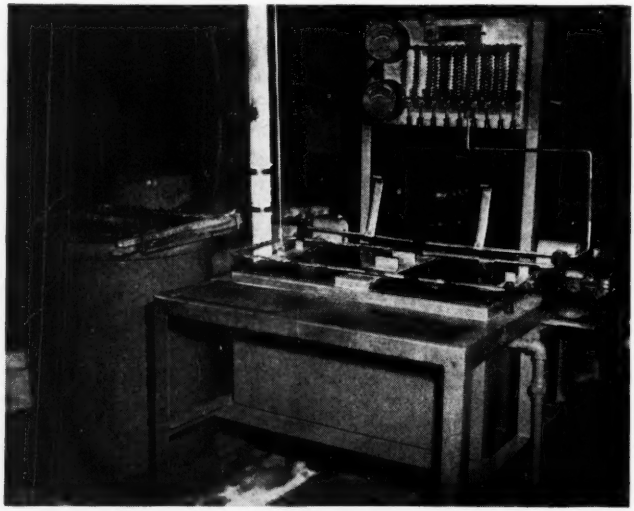
In plating to the required thickness and still meeting the tolerances required for Class 3 fittings, it is, of course, essential to make allowance for thickness of plate when machining to size. In some instances it is necessary to use stop-off devices to prevent undesired plating of finely machined parts. Metallic mechanical devices are primarily used for this purpose at DeVilbiss, where, due to the unusually high quality of plate which must be attained to meet surgical and medical requirements, stop-off masks of rubber are contraindicated because of slight seepage and staining of parts.

As previously mentioned, a considerable amount of hard chromium plating is done for increased tool life. Decorative and protective coatings of chromium are plated on powder blowers, physicians' medical atomizers, and so on. Various industrial spray gun parts are hard chromed to increase the wearing resistance of air cap inserts and other surfaces with a thickness of 0.001 inch of chromium. It is interesting to note in this connection that there is no hydrogen embrittlement problem with brass basis metal when the latter is hard chromed. Valves and valve seats for industrial spraying equipment are also hard chrome plated.

Surfaces such as those of medicinal atomizer parts finished with decorative chromium plate at DeVilbiss must be comparable to the highest quality jewelry. These parts are commonly soldered together with a 70-30 solder, which makes the attainment of a high-class uniform chromium finish over the soldered joints largely a matter of proper and adequate cleaning procedure. One of the most important steps in finishing parts for physicians' sprays consists in individually washing these parts out by hand under pressure. All small diameter tubes must be thoroughly cleaned inside and out.

The plating of spray gun parts is in reality an intricate process. As an example can be cited the steps involved in finishing the air cap of a DeVilbiss MBC spray gun, part MB 4039, No. 30:

1. The insert is hard chromium plated on a rack designed to stop-off the plate so that after plat-



Gold plating unit in the electroplating department of the DeVilbiss Company

B&A Ammonium Thiosulfate

(60% Solution, Technical) **NON-VOLATILE** **NON-INFLAMMABLE** **READILY SOLUBLE**

Whether you plate tableware, jewelry or airplane bearings, you can bring your product "bright from the bath" by the addition of Baker & Adamson Ammonium Thiosulfate. When used in silver cyanide plating, this B&A purity product changes the appearance of the plate from the normally dull or matte deposit *to a bright, smooth finish.* Subsequent buffing, burnishing or polishing operations are reduced to a minimum, with attendant savings.

B&A Ammonium Thiosulfate Solution is a clear, colorless liquid virtually free of metal impurities. Unlike ordinary brighteners for silver plating, it is *non-volatile and non-inflammable. It is soluble,* too . . . no delays for messy mixing; just add it directly to the bath.

Leading manufacturers of silverware are already enjoying the advantages of B&A Ammonium Thiosulfate Solution in their operations. Why don't you? For full information, write or call the nearest Sales and Technical Service Office below. No obligation, of course.

Setting the Pace in Chemical Purity Since 1882

B&A
STANDARD OF PURITY

Date_____

CONTROL ANALYSIS REPORT

BD - Add____lbs. chromic acid,____oz. sulphuric acid, and____oz. nitric acid

BA - " ____ " " " ____ " " " " ____ " " "

Acid Add____qts. hydrochloric acid

Electric Cleaner - Add____lbs. Northwest #30

Soak Cleaner - Add____lbs. Northwest #45 and____qts. #20

Chromium Plating Solution - chromic acid____g/l, sulfate____g/l, ratio_____

Nickel Plating Solution - pH____. Brightner Add____ozs.

	Zinc	Cyanide	Free Cyanide	Caustic
Semi				
Barrel				
Still				

Signed_____

Form of routine control analysis report used by laboratory at DeVilbiss for reporting analyses of plating solutions

ing the solder will flow properly and the subsequent finish coat will completely cover the assembled part. Solder will not adhere to chromium.

2. The part is assembled and soldered in place.

3. Fire dip to free of dirt, acid and flux.

4. Bright dip.

5. Finish machined and then assembled.

6. Polished and buffed.

7. Bright zinc plated while on special metal holder to stop-off plating of threads.

A single part for a DeVilbiss manufactured nebulizer consisting of a small bore tube is given a silver flash, then assembled, formed, soldered, polished and buffed, bright nickel plated, chromium plated and finally chrome buffed. The MBC No. 402 spray head barrel is zinc plated to a finish which closely resembles chrome plate in appearance. In the case of the No. 56SL atomizer tube, traces of buffing compound must be hand picked out of the holes at the tip of the tube with special piano wire held in a pin vise. The tubes are then racked, subjected to a cleaning operation, bright nickel plated and then chromium plated. All chrome is blown out of the inside of each tube with water under pressure. The outer surface of the inner tube of the DeVilbiss No. 114 atomizer, designed for use with drugs which may be affected by contact with other metals, is given a good coating of silver.

Of such paramount importance is the highest possible quality of finishing held at the DeVilbiss Company that extraordinarily rigid control analysis reports are regularly required from the laboratory of all plating solutions being used. The thoroughness of these tests is such that their partial inclusion herewith is considered desirable for the benefit of interested readers.

A NEW AND SUPERIOR RESIN-TYPE CEMENT . . .

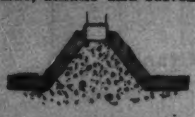
PENNSALT PRF CEMENT

Designed specifically for bonding corrosion-proof brick and tile in uses where acids, alkalis and solvents are encountered

Typical applications are laying floors and drains, and lining tanks in metal finishing shops where a special cement is required that will resist corrosive acids, alkalis and solvents.

Typical Floor Construction

Drain or Tank Lining



Protection for Supports

Installed four years ago, these troughs and drains, in

constant wartime use, have required no repairs nor maintenance.

PROPERTIES

Chemical Resistance—Inert to: Alkalis, fats, oils, solvents, fresh or salt water, steam, all mineral acids including hydrofluoric acid, with exception of high concentrations of strong oxidizing agents and alternate contact with strong acid and alkali.

Color	Black
Permissible temp. in use	Up to 375° F.
Absorption (ASTM)	Less than 0.5%
Compressive strength	12,000-14,000 lbs. per sq. in.
Tensile strength	1,000-2,000 lbs. per sq. in.
Modulus of rupture	1,800-2,100 lbs. sq. in.
Coefficient of thermal expansion	.00000871 inches/inch/degree F. (In range 80-350° F.)
Porosity	Completely impermeable, even at elevated temperatures.
Joint thickness recommended	1/16-1/8 inch
Mortar required to butter one 9 inch brick on 3 sides	½ lb. (approximately)
Storage	Can be stored indefinitely in a cool place.
Hardening time	May be placed in service within twenty-four hours.
Containers (Non-returnable)	POWDER: 20 lb. drum, 100 " " , 250 " " — SOLUTION: 10 lb. drum, 50 " " , 375 " "

SPECIAL CHEMICALS DIVISION PRODUCTS—Acid, Alkali, and Solvent proof cements—Acid, Alkali, and Solvent Emulsion Type Cleaners—Paint Strippers—Pickling Agents—Rust Inhibiter.

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DeVilbiss Plating Solutions—Determinations and Methods of Control

Chromium Plating Solution

Hexavalent Chrome Content — Pipette 10 c.c. sample into 250 c.c. volumetric flask, take 5 c.c. aliquot, add 15 c.c. of 10 per cent potassium iodide solution, 10 c.c. hydrochloric acid and titrate with tenth normal sodium thiosulfate to green end point using starch indicator.

Sulfate Content — Pipette 10 c.c. sample into 400 c.c. beaker, add 15 c.c. hydrochloric acid, 50 c.c. reducing mixture (300 c.c. isopropanol, 140 c.c. hydrochloric acid, 500 c.c. acetic acid) and 100 c.c. water. Warm on hot plate until all hexavalent chrome is completely reduced (grass green color), add 15 c.c. 10 per cent barium chloride and let cool for ½ to 1 hour. Filter into tared Gooch crucible, ignite and weigh.

Calculations

c.c. n/10 $Na_2S_2O_3$ x 16.67 = GMS/L CrO_3

GMS $BaSO_4$ x .4115 x 100 = GMS/L SO_4

Copper Plating Solutions

Metallic Copper — Pipette 5 c.c. sample to 400 c.c. beaker, add 5 c.c. nitric acid and 5 c.c. sulfuric acid. Fume strongly. Take up with about 350 c.c. water and plate out copper electrolytically.

Free Cyanide — Pipette 5 c.c. sample in 250 c.c. Erlenmeyer, dilute to 100 c.c., add 1 c.c. potassium iodide and titrate with tenth normal silver nitrate to first sign of turbidity.

Carbonates — Pipette 5 c.c. sample into 400 c.c. beaker, dilute with water, heat almost to boiling and add 15 c.c. of 10 per cent barium chloride slowly while stirring. Let stand and cool for 15 minutes. Filter and wash precipitate with warm water. Dissolve the precipitate with 10 c.c. one normal hydrochloric acid, and titrate the excess acid with tenth normal sodium hydroxide using methyl orange.

Calculations

GMS deposited x 26.7 = oz./gal. copper

c.c. N/10 $AgNO_3$ x .262 = oz./gal. free sodium cyanide

Convert c.c. N/1 HCl to c.c. N/10 HCl in carbonate determination then (c.c. N/10 HCl-c.c. N/10 NaOH) x 1.41 equals oz./gal. sodium carbonate.

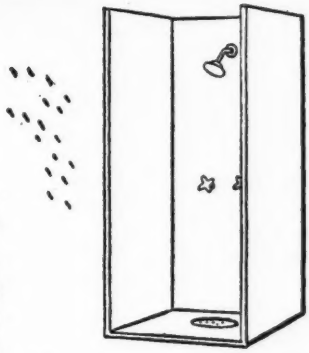
Nickel Plating Solution

pH — Determined by standard quinhydrone apparatus.

Boric Acid — Pipette 5 c.c. sample into beaker, dilute with water, add 50 c.c. .5 normal sodium hydroxide. Stir, filter off nickel hydroxide on Buechner funnel and wash well. Add methyl orange indicator and exactly neutralize with hydro-

USERS TELL US WE'VE DEVELOPED A

Better Finish for Shower Stalls



CHARACTERISTICS:

Applicable for pressed wood or metal . . . Highly resistant to soap, alkali, heat and moisture . . . Long wearing (chip-proof and practically immune to scratches) . . . Excellent in color stability . . . Durable (provides maximum protection against rust, due to improved bonding qualities).

APPLICATION:

One-coat and two-coat systems are available. Finish is sprayed on.

BAKING TIME:

Pressed Wood: Primer, 20 minutes at 275°; finish, 20 minutes at 300° F. . . .

Metal: 20 minutes at 300° F. or 7 minutes with Infrared Drying.

(*Optional schedules are available.*)

Vedoc

All *Vedoc* finishes are developed for a specific use, then slightly varied to best fit each customer's production setup. For more information about these "better finishes", write . . .

LIQUID PLASTICS DIVISION

FERRO ENAMEL CORPORATION

CLEVELAND 5, OHIO

chloric acid. Add phenolphthalein and 5 c.c. glycerine. Titrate with tenth normal sodium hydroxide until just pink. Add 2 or 3 c.c. of glycerine and finish titrating to faint permanent pink. Keep volume as small as possible.

Chloride — Pipette 5 c.c. sample into a 250 c.c. Erlenmeyer, dilute and add 1 c.c. 2 per cent potassium chromate. Titrate with tenth normal silver nitrate to first faint orange precipitate. Check against standard nickel solution.

Single Salt — Pipette 5 c.c. sample into 250 c.c. Erlenmeyer. Add 2 gm. ammonium chloride and 20 c.c. saturated sodium pyrophosphate solution. Dilute and add dilute ammonium hydroxide to slight excess. Add 1 c.c. potassium iodide solution and titrate with sodium cyanide until just clear. Check against standard nickel solution.

Brightener — Measure 100 c.c. sample into 1000 c.c. flask, add 300 c.c. water, 15 c.c. potassium iodide solution, 25 c.c. hydrochloric acid and titrate with tenth normal sodium thiosulfate with starch indicator to a light green color. Report c.c. tenth normal sodium thiosulfate used.

Calculations — c.c. N/10 NaOH x .165 = oz./gal. boric acid

$$\frac{\text{c.c. N/10 } AgNO_3 \text{ for standard}}{\text{c.c. N/10 } AgNO_3 \text{ for unknown}} = \frac{\text{oz./gal. } NiCl_2 \cdot 6H_2O \text{ of standard}}{X}$$

$$\frac{\text{c.c. NaCN for standard}}{\text{c.c. NaCN for unknown}} = \frac{\text{oz./gal. } NiSO_4 \cdot 6H_2O \text{ for standard}}{X}$$

Brightener: for each .1 c.c. less than 1 c.c. add 4 oz.

Zinc Plating Solutions

Zinc Metal Content — Pipette 5 c.c. sample into 250 c.c. Erlenmeyer, add 5 c.c. nitric acid and 5 c.c. sulfuric acid. Fume strongly, cool, add 10 c.c. water slowly, 2 c.c. hydrochloric acid, boil 2 minutes, cool, dilute to 100 c.c. and titrate with tenth normal potassium ferrocyanide using uranyl nitrate as outside indicator to a greenish-brown endpoint.

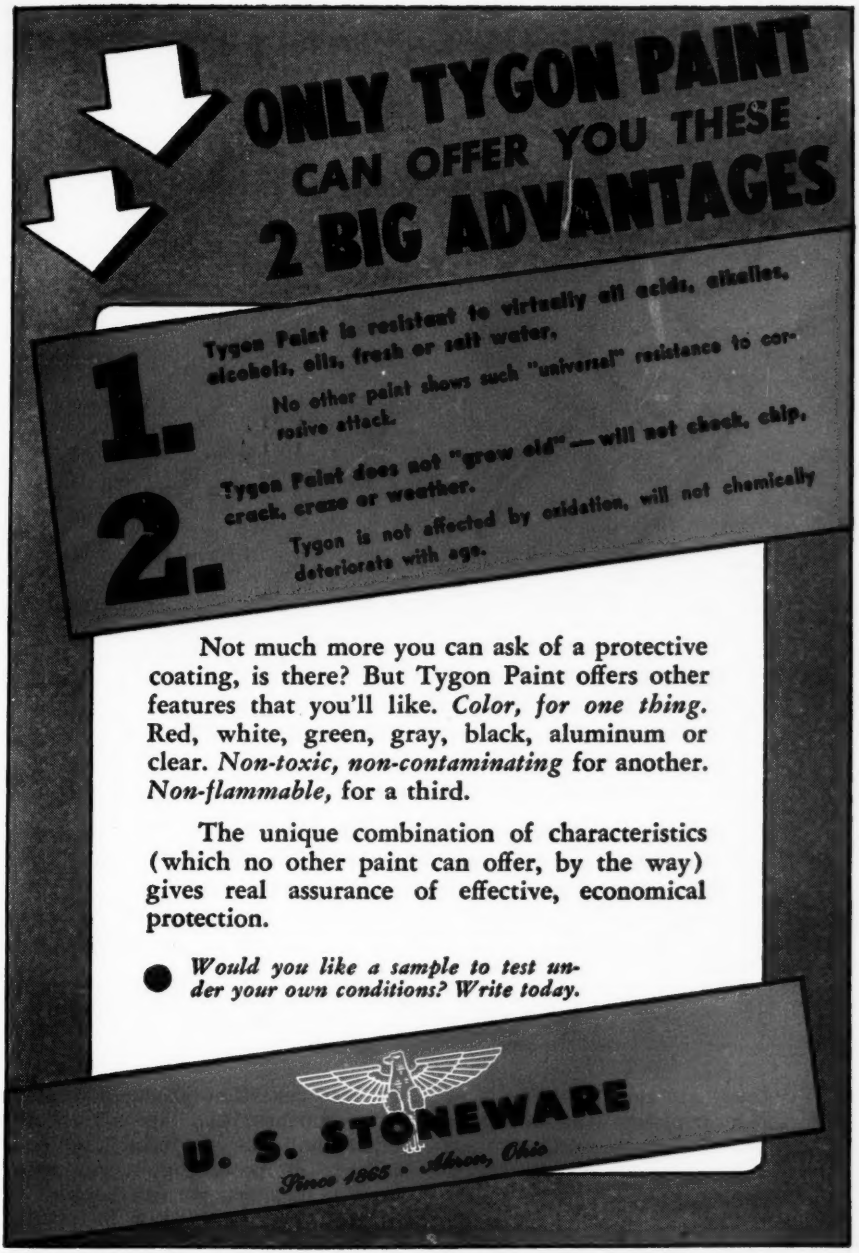
Total Cyanide — Pipette 5 c.c. sample into 100 c.c. volumetric flask, add water and mix well. Take 25 c.c. aliquot, add 5 c.c. 10 per cent sodium hydroxide, 1 c.c. potassium iodide and titrate with tenth normal silver nitrate to first sign of turbidity.

Total Sodium Hydroxide — Take another 25 c.c. aliquot, add ½ the required c.c. of tenth normal potassium ferrocyanide for zinc and the total c.c. of tenth normal silver nitrate required for sodium cyanide. Add a few drops of phenolphthalein indicator and titrate the total alkalinity with tenth normal hydrochloric acid.

Calculations — c.c. N/10 $K_4Fe(CN)_6 \cdot 3H_2O$ x .175 = oz./gal. zinc

c.c. N/10 $AgNO_3$ x 1.05 = oz./gal. total NaCN

oz./gal. total NaCN — (oz./gal. Zn x 1.5) = oz./gal. free NaCN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(Above) Group of metal parts adaptable to backstand finishing

Surface Preparation With Abrasive Belts

By E. E. OATHOUT

Methods and Equipment Engineer
Behr Manning Corporation, Troy, New York

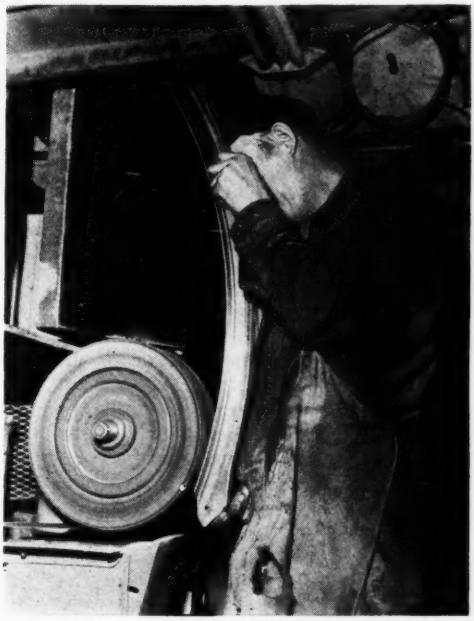
IF there are any two things of which industry can be unreservedly certain in the period ahead, they surely are these: first, competition will force attention to the building of greater sales appeal into peacetime products through better finishes; and, secondly, competition will likewise force lower cost methods of producing these better finishes. In short, we can be sure of the return of competition in quality,

appearance, and price to an industry which has run for five years on an uncompetitive basis of functional perfection and speed with little regard for appearance or price.

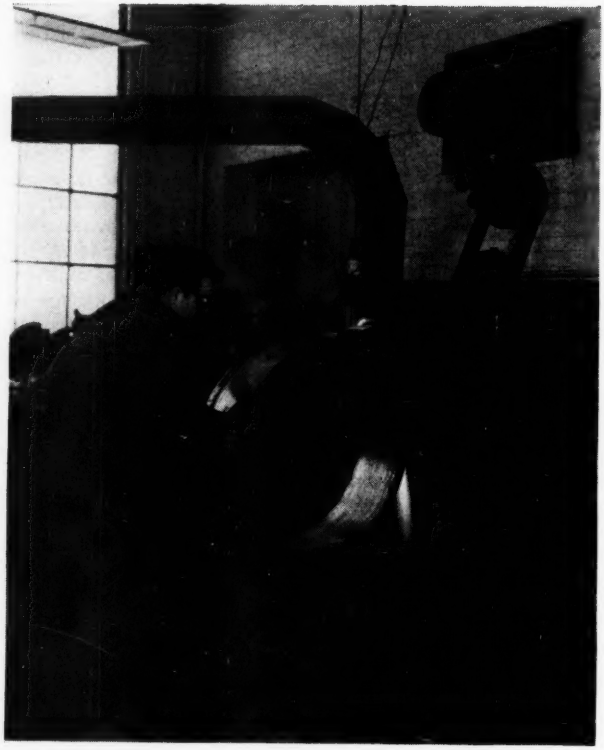
In all of this quest for improvement both of product and methods, there are those war lessons which will be helpful and those which for cost reasons cannot be considered. It is variously stated that industry has experienced the technological improvement of 20 to 50 years during the four years of war. In some instances, production speed-up was attained at the sacrifice of cost, a secondary consideration to a government at war. In others, the ingenuity and resourcefulness of industry brought forth new methods or new adaptations of existing methods which not only speeded production but also decreased production costs and lowered the man-power skills required.

Surface preparation of metals by means of coated abrasive belts has been and is one of these latter war improvements, thoroughly "combat" tested for speed, cost reduction, and quality. For, during the war years, the metal-finishing industry has tested the improved effectiveness of the idler backstand-abrasive belt conversion principle. Though metal finishing embraces two contrasting methods, metal plating and organic coating, the two walk on common ground in the prefinishing phase; that is, the function of producing a smooth enough finish for the coating to be applied. Regardless of whether the parts be castings, forgings, stampings, or what not, surface preparation is common to both, and, at the outset of this discussion, it should be pointed out that, form the standpoint of abrasive belt application, the differing requirements between metal plating and organic coating can be dismissed in terms of the degree of smoothness. To the extent that a fair "tooth" is required for an organic coating, coarser abrasive belts may be specified. To the extent that no "tooth" is required in metal plating, then the finer belts are indicated.

The fundamental war lesson learned by the metal-finishing industry is this: that coated abrasive belts adapted to polishing lathe use through the introduction of an idler backstand pulley and contact wheel



Polishing B-24 Liberator airplane flaptracks on a Rome Model BS-10 backstand

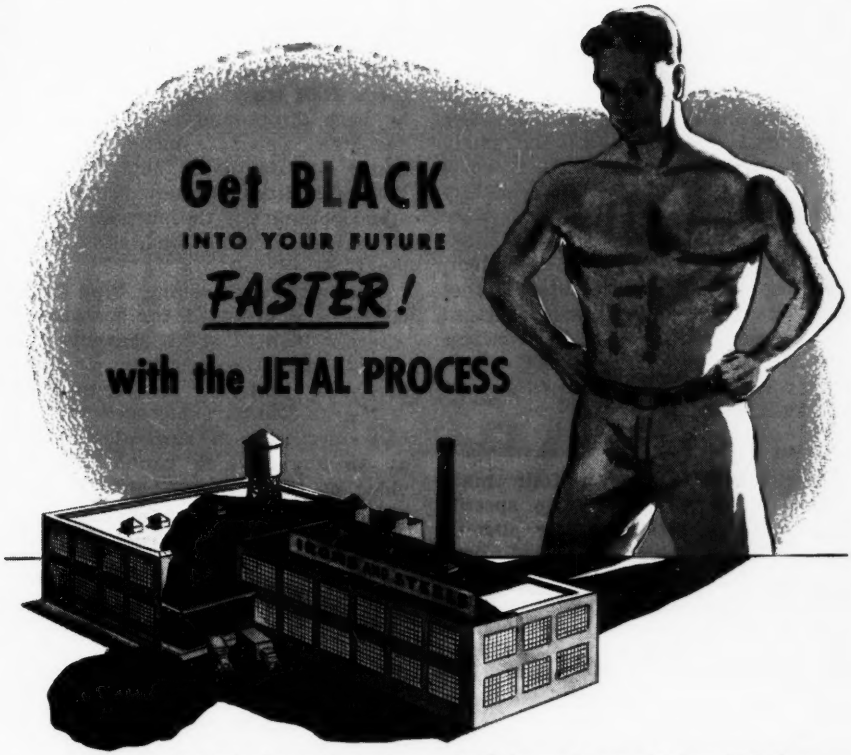


Cleaning up the surface of a steel motor frame with a No. 24 heavy duty Metalite cloth belt using a hookup with backstand mounted on side wall

consistently and almost without exception provide for greatly increased operator ease and a lowering of the operator's skill requisite. We bring to mind the case of a manufacturer of 155 mm. artillery shells in which two operators, averaging 18 projectiles per hour at full effort, forced a methods study. The installation of an abrasive belt backstand conversion unit resulted in an increase of production to 60 shells per hour for one operator. A California plating and polishing house received a contract for plating B-24 flaptracks, only to find that they could not hold the Army specified tolerances using their present polishing methods. With the installation of a backstand unit, rejects were eliminated and production increased.

These citations can be multiplied one hundred fold in such widely contrasted products as pruning shears, plow shares, electric irons, golf clubs, steel tubing, dental instruments, locks, and building hardware.

To the superintendent or manager of an industrial finishing department or the owner of a custom or job plating firm, the advantages of the new method are evident and they may be even more readily appreciated by a simple demonstration which can be made right in the shop. Take a factory-new uncoated set-up wheel and set it on a bench. Then take a sheet of any kind of abrasive cloth and tear off a strip the width of the wheel face. Now wrap the abrasive strip around the face of the wheel and feel it for bump-free, crack-free, sharp, uniform cutting surface. Then notice that the abrasive strip retains the full resilient action of the set-up wheel underneath. Now visualize that abrasive cloth strip as an endless belt traveling at full speed from an idler pulley to the contact wheel and you have the



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Simplified Conversion

The conversion to coated abrasive belts through the use of the idler backstand pulley is an extremely simple task. A cloth contact wheel of the correct resiliency is merely mounted on the lathe spindle in place of the set-up wheel. The idler backstand is then installed on the floor, wall, or ceiling approximately 4 feet from the lathe spindle and so placed as to permit running the endless abrasive belt over the two. The contact wheel thus becomes both a drive pulley and a work wheel.

Four Types of Idler Backstands

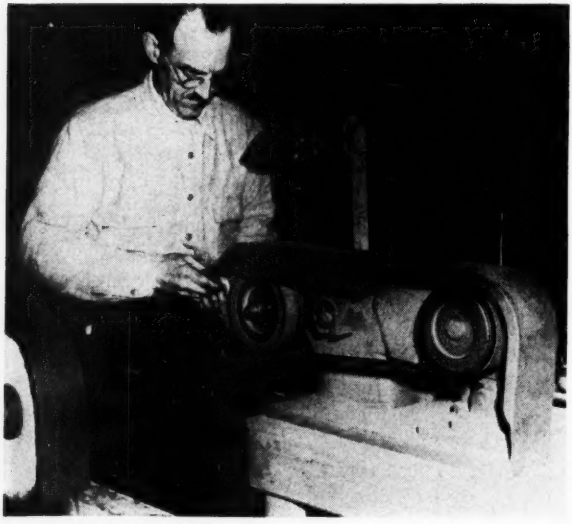
Backstands fall into four main types, each adapted to the specific need of the particular floor plan or setup. These include floor, wall, ceiling, and bench backstands. The floor type backstand, as the name implies, is a unit incorporating a substantial base, supporting column, and idler pulley for installation in back of a floor type polishing lathe or jack. Several types of backstands are available with both counterweight and spring controlled belt tension features. Belt trackage is made possible by both direct and remote controls, depending upon the model employed. Some manufacturers have incorporated an additional pulley on the backstand column for the purpose of conserving floor space and adding belt length.

The wall and ceiling type backstands are provided for installation where a lack of space prevents consideration of the floor type, or when, for some particular requirement, it is desirable to have a coated abrasive belt operate in a vertical plane or at an angle which cannot be provided by the floor type model.

Bench Models

Bench backstand units consist of a bench lathe, idler pulley or pulleys, and contact wheel. These units are designed for light duty grinding and finishing operations where the heavier type of equipment is not required and smaller belt sizes are acceptable. Durably constructed, they are ideally suited for a wide variety of deburring, grinding, and polishing jobs in the metal-working field.

The versatility of the bench backstand unit makes it most acceptable to the trade in general as it may also be readily converted to the use of



Finishing a Lyle gun firing mechanism using a Porter-Cable bench backstand

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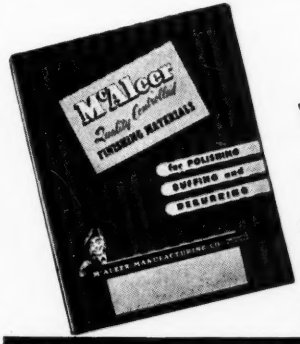

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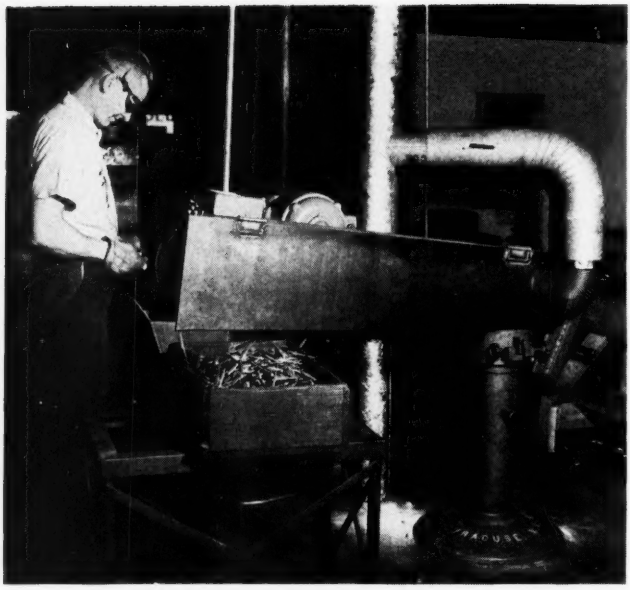


Grinding and finishing Grape shear blades on a Porter-Cable backstand

a grinding wheel, wire wheel, or polishing buff. Platens may also be used between the idler pulley and contact wheel for sanding flat work. The resiliency of the coated abrasive belt in operation over the compressed canvas contact wheel is said to appeal especially to operators grinding and burring small parts.

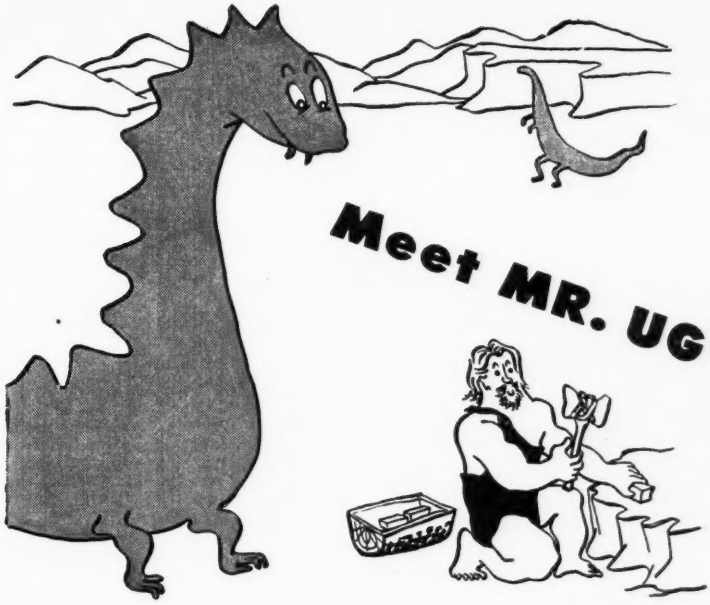
Bench grinders can likewise be converted to small idler backstand assemblies by mounting a 6 or 8-inch diameter recessed contact wheel in place of a grinding wheel and installing a bench backstand directly behind the grinder. Such mountings should be made to accommodate belts measuring 2½ inches wide x 48 or 60 inches long.

Speed

The average lathe operates at from 1,800 to 3,600 r.p.m., slower speeds being used for grinding and higher speeds for polishing and buffing. Most contact wheels are limited to a speed 7,500 s.f.p.m. (12-inch diameter wheel at 2,400 r.p.m. or 14-inch diameter of the at 2,000 r.p.m.). The r.p.m. of the lathe must, therefore, be considered in conjunction with the diameter wheel contact wheel to be used in order that the proper cutting speed of the coated abrasive belt be maintained. (Formula: s.f.p.m. = r.p.m. x diameter x 0.2618) Experience has shown that, in general, the coarser grits (24-X, 36-X) give maximum performance at slower speeds (approx. 4,500 s.f.p.m.) while the finer grits (80-X, 100-X, 120-X) produce superior finishes when operated at higher speeds (approx. 6,000 s.f.p.m.). The condition of the equipment in the plant in which the conversion job is being done should, of course, be taken into consideration when recommending higher speeds.

Horsepower

Power requirements are dependent on the type of work being done and whether one or two spindles are available. There are many single spindle motors of 2½ to 5 h.p. in use with grinding or set-up wheels which can be converted to the use of coated abrasives. In general, a minimum of 2½ h.p. per spindle is required for the



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average coated abrasive grinding or polishing operation. Therefore, double-spindle lathes operating two backstand idler pulleys would require a minimum of 5 h.p. However, where heavy duty grinding or the combined use of rag polishing wheels and coated abrasive belts is contemplated on a two-spindle lathe, additional power is necessary. Seven and one-half to 10 h.p. is suggested.

Summary

In conclusion, we might say that to the metal-finishing department which will plan to meet peacetime competition with improved finishes and low-cost production of such finishes, the magnitude and importance of the new coated abrasive method cannot be overemphasized. The general acceptance of this method of grinding and finishing by the metal-working trades has already stimulated seven machinery manufacturers to build backstand idler pulleys, several of whom have gone a step further and brought out complete units for bench mounting.

"Precious Metals Plating Solutions" is the title of an eight-page booklet issued by A. Robinson & Son, 131 Canal St., New York, N. Y. The booklet provides information on the development and advantages of Robinson Assayed Gold Plating Solutions and general directions for using same. Copy free upon request.

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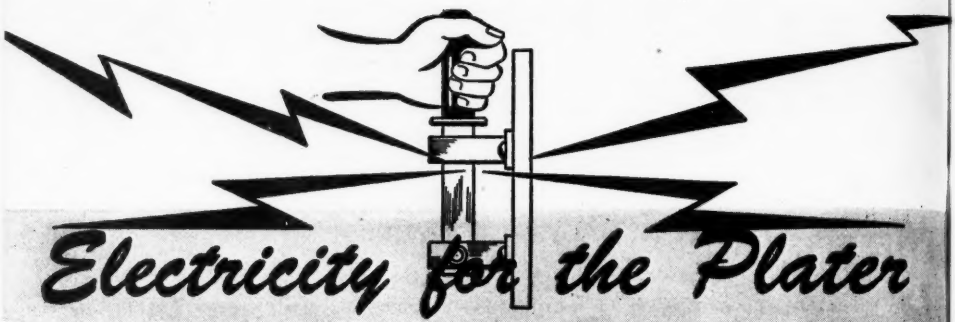

Electricity for the Plater

D. A. COTTON

Part IV

WE have previously noted that the electrical resistance of metals increases with rise in temperature. The change of resistivity per degree is called the temperature coefficient. It varies somewhat for various metals and also with temperature. For example, the temperature coefficient for annealed copper is as follows:

0.00427 per degree C. or 0.00238 per degree F. at 0° C. (32° F.)
0.00401 per degree C. or 0.00223 per degree F. at 15° C. (59° F.)
0.00393 per degree C. or 0.00218 per degree F. at 20° C. (68° F.)
0.00385 per degree C. or 0.00214 per degree F. at 25° C. (77° F.)

However, there is no need to "split hairs" and for all practical purposes it is satisfactory to use the coefficient of 0.004 per degree C. and 0.0022 per degree F. for such metals as copper, aluminum, and so on, at all ordinary temperatures.

To put this in other words, the resistance of a conductor increases by an amount equal to 0.004 of its value at any temperature for each degree Centigrade rise above that temperature (0.0022 per degree F.).

The formula expressing this is:

$R_2 = R_1 \ [1 + k(T_2 - T_1)]$ where

R_2 is the desired resistance at some temperature.
R_1 is the resistance at the reference temperature.
k is the temperature coefficient (0.004 for C., 0.0022 for F.).
$(T_2 - T_1)$ is the difference in temperature.

The factor k $(T_2 - T_1)$ is added or subtracted according as T_2 is higher or lower than T_1.

Example:

A resistance measures 15 ohms at 30 deg. C.
(1) What will it be at 50 deg. C.?
(2) What at 10° C.?

Solution (1):

$T_2 - T_1 = 50 - 30 = 20$
$k(T_2 - T_1) = 0.004 \times 20 = 0.08$
$R_2 = 15 \ (1 + 0.08) = 15 \times 1.08 = 16.2$ ohms.

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Solution (2):

$T_2 - T_1 = 10 - 30 = -20$

$k(T_2 - T_1) = 0.004 \times -20 = -0.08$

$R_2 = 15\ (1 - 0.08) = 15 \times 0.92 = 13.8$ ohms.

The practical significance of this relation between resistance and temperature is evident when we consider that increase in the resistance of a conductor means greater voltage drop or line drop for a given current flowing in it. For instance, suppose a bus bar rises in temperature 45 deg. F. above room temperature. This produces a change in resistance of 45×0.0022 or 0.1 which is a 10 per cent increase in line drop, causing a consequent loss of voltage applied at the load.

All this leads us logically into a consideration of the fact that electric conductors become heated by the passage of current through them. Before we discuss this, however, it is necessary to define another electrical unit, the watt.

The watt is the electrical unit of power. Any unit of power is a rate of doing work. For instance, the work done in raising a 550-pound weight one foot is 550 foot-pounds. But if this be done in one second, it represents one horsepower in mechanical units.

Similarly, the electrical equivalent of the foot-pound of mechanical work is the joule. The joule is the work done in forcing a current of one ampere through a resistance of one ohm. When this is done in one second, work is being done at the rate of a joule per second or at a power of one watt.

Since it requires one volt to force one ampere through one ohm resistance, the watt also represents the amount of power in a circuit when a pressure of one volt causes one ampere to flow. Mathematically then, watts are volts times amperes or $W = EI$; also, since $E = IR$, $W = I^2R$.

It is customary to call the watts lost due to resistance drop in lines or through rheostats I^2F losses, whereas the useful load watts are obtained by taking the product of E times I.

Since the calculation of power in watts gives cumbersome figures, a larger unit called the kilowatt is used. A kilowatt is one thousand watts and is abbreviated to kw.

Let us consider another problem as shown in the diagram in Fig. 21. This diagram represents a generator furnishing current at 8 volts to a circuit consisting of copper bus bars **AB** and **CD**, a rheostat **R**, and a plating tank **T**. The bus bars consist of 30 feet of flat copper 1 inch wide and 0.25 inch thick and it is assumed that room temperature is 80 deg. F. The rheostat has a resistance of 0.004 ohm and the bus rods and solution in the tank, a total resistance of 0.015 ohm.

Problem:

(1) What current will flow in the circuit?

(2) How is the voltage distributed?

(3) What is the power distribution?

Solution (1):

It is first necessary to calculate the resistance of the bus bars. The cross-section is $1{,}000 \times 250$ or 250,000 square mils.

$1.273 \times 250{,}000 = 318{,}250$ circular mils.

$$R = \frac{10.37 \times 30}{318{,}250} = 0.00098 \text{ ohm at 68 deg. F. (10.37 is k at 68 deg. F.)}$$

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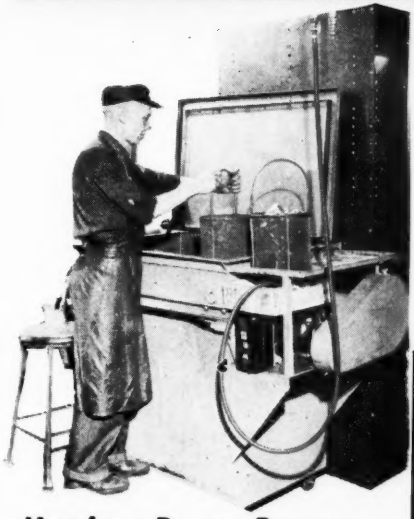

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R at 80 deg. F. $= 0.00098\ (1 + k(80\text{-}68))$
$= 0.00098\ (1 + 0.0022 \times 12)$
$= 0.00098 \times 1.026 = 0.001$ ohm.

We now have the total resistance of the circuit:

Line	= 0.001
Rheostat	= 0.004
Tank	= 0.015
Total	= 0.020 ohm

Then, the current in the circuit is $\frac{8}{0.02} = 400$ amperes.

Solution (2):

The voltage drops are distributed as follows:

Line IR	$= 400 \times 0.001 =$	0.4 volt
Rheostat	$= 400 \times 0.004 =$	1.6 volts
Tank	$= 400 \times 0.015 =$	6.0 volts
Total		8.0 volts

Solution (3):

The total load on the generator is $8 \times 400 = 3200$ watts or 3.2 kw. This is distributed as follows:

I^2R loss in line, $400 \times 400 \times 0.001$	= 160 watts
I^2R loss in rheostat, $400 \times 400 \times 0.004$	= 640 watts
Power in tank (EI), 6×400	= 2,400 watts ($400^2 \times 0.015$)
Total	3,200 watts or 3.2 kw.

Returning now to the heating effects of electric current in conductors, we will study Joule's law. The electric unit of heat is the joule named after James Joule who discovered the laws of the heating effect of electric current and also the mechanical equivalent of heat. It is defined as the heat generated in one second by a current of one ampere flowing through a resistance of one ohm.

Mathematically stated: $H = I^2Rt$ or $H = EIt$. Since I^2R or EI represents watts, this formula states that watts times the time in seconds equals joules.

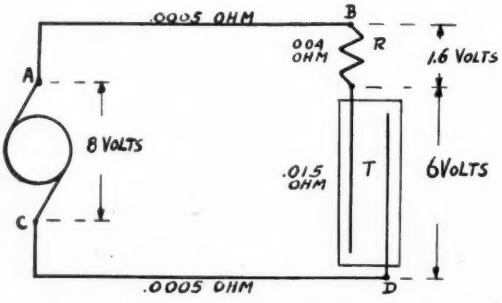

Fig. 21—Problem involving application of Ohm's law

The experiments of Joule and Lenz resulted in the law called Joule's law, which relates the unit of work, the joule, with a unit of heat by introducing the calory. If the heat generated by passing an electric current through a wire be determined by allowing water to absorb the heat and measuring the the rise in temperature of the water, it is found that one watt-second or joule of

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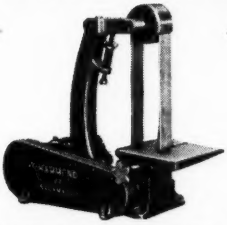

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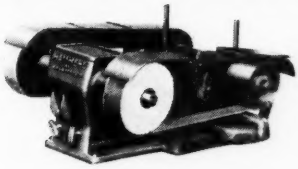

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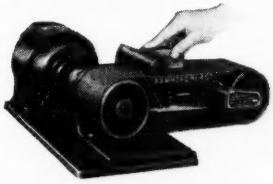

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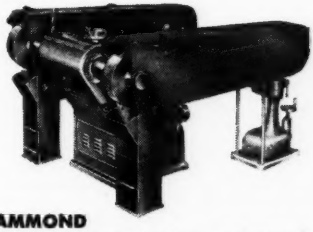

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electric energy is equivalent to 0.239 or 0.24 calory. Or stated in another way, one watt is equivalent to 0.24 calory per second. The figure 0.24 is called the heat equivalent of electricity. The converse of this may be stated that one calory equals 4.18 joules.

The metric unit of heat, called the small calory, is the amount of heat required to raise one gram of water one degree Centigrade. The large calory is sometimes used. It is one thousand times as large as the small calory, differing from it in the respect that a kilogram or 1,000 grams of water is used in this unit.

The corresponding English heat unit is the British Thermal Unit, abbreviated to B.T.U. It is the amount of heat necessary to raise the temperature of one pound of water one degree Fahrenheit. The B.T.U. therefore equals 252 small calories ($453.6 \div 1.8$).

Note: There are 453.6 grams in one pound avoirdupois and one Centigrade degree equals 1.8 Fahrenheit degrees. Also, since the kilogram equals 2.2 pounds avoirdupois, a large calory equals 3.96 B.T.U. (2.2×1.8).

The formula $H = EIt \times 0.24$ gives the heat units in calories and the variation of it, $H = EIt \times 0.0009477$, gives the heat units in B.T.U.

It is obvious from the previous discussion that this heating of a conductor due to passage of electric current through it is objectionable when the conductor is used as part of a circuit delivering power to an electric machine. This is not only because it produces voltage drop and power loss in the line, but unless the conductors are of sufficient current-carrying capacity, they may become heated above a safe operating temperature.

Excessive current in a conductor may develop heat more rapidly than it can be dissipated and may even cause the conductor to melt. Heat produced in conductors is partially reduced by conduction, radiation, or convection. The temperature of a conductor will not keep on rising indefinitely, because as it rises, a greater proportion of the heat gets away by means of one or more of the methods mentioned above.

One of the principal requirements for avoiding excessive heat is that the conductors be designed with sufficient cross-section to carry the required current. In other words, a proper allowance of circular mil area per ampere of current to be carried will avoid a temperature rise too high for safety.

This is leading us directly to a consideration of wire gauges and to rules governing safe operating temperatures of electric circuits. But before we leave this subject of Joule's law, suppose we briefly consider some of the useful applications of this heating characteristic of electric current. In the manufacture of electric flat irons, toasters, coffee percolators, heaters, and other devices, deliberate use is made of this characteristic.

Let us take one or two examples to show how such problems are handled.

Example (1):

How much heat is generated per hour in an electric iron using 5.2 amperes at 115 volts?

Solution:

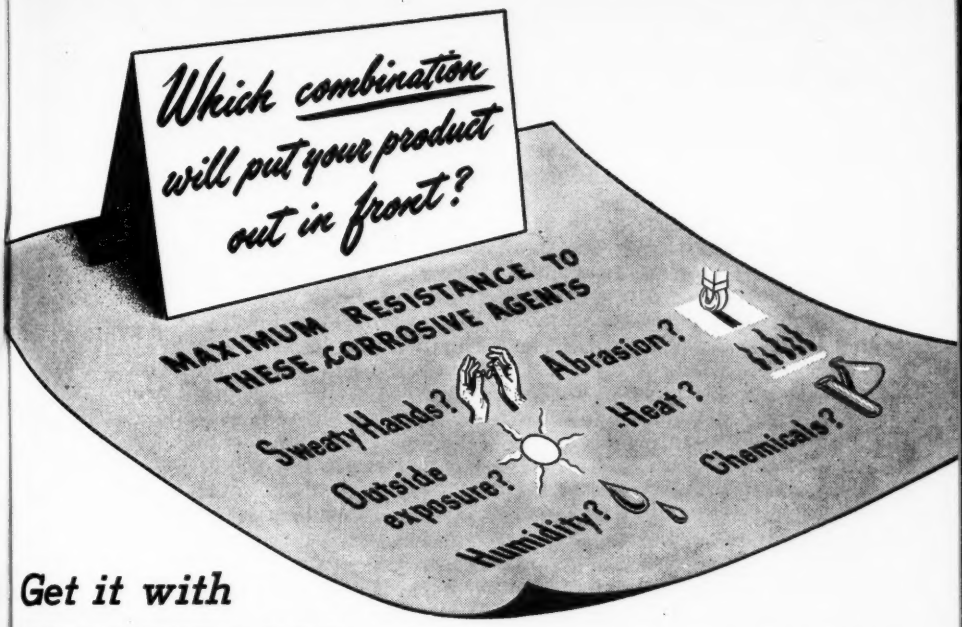
$H = EIt \times 0.24$ calories.

Power consumed is $115 \times 5.2 = 598$ watts.

Calories per second are $0.24 \times 598 = 143.52$.

Calories per hour are $3600 \times 143.52 = 516{,}672$.

Expressed in B.T.U., this would be $115 \times 5.2 \times 3600 \times 0.00095 = 2045.16$ B.T.U.



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Example (2):

An electric heater is used to heat 100 gallons water from 60 to 170 deg. F.

(a) How much power must be used if it is to be heated in one hour by a heater which is 85 per cent efficient?

(b) What will it cost if electricity is sold at 2 cents per kilowatt-hour?

Solution (a):

This problem introduces a new factor. The term 85 per cent efficiency means that the heater, due to radiation and other losses, is producing only 0.85 of the theoretical heat units called for in Joule's law. Our formula will then be: B.T.U. $=$ EIt $\times$ 0.00095 $\times$ 0.85. Since, in this case, we are solving for watts, we transform the above equation into $EI = \frac{B.T.U.}{t \times 0.00095 \times 0.85}$

where t for this problem is 3600 seconds.

The B.T.U. required are found as follows: 100 gallons of water weighs 100 $\times$ 8.33 or 833 pounds and to raise its temperature 110 deg. F., it must absorb 833 $\times$ 110 $=$ 91,630 B.T.U. Then, $EI = \frac{91,630}{3600 \times 0.00095 \times 0.85} =$ 31,520 watts or 31.52 kw.

Solution (b):

This problem introduces another term not previously mentioned. The term kilowatt-hour is one used in the sale of electric power. It is the amount of electricity consumed when power is used at the rate of one kilowatt for one hour.

For example, if an electric flat iron consuming about 660 watts be used for two hours, the cost in kilowatt-hours (abbreviated kw.-hrs.) is 2 $\times$ 0.66 $=$ 1.32 kw.-hrs. If power is sold at 6.5 cents per kilowatt-hour, the cost will be 1.32 $\times$ 6.5 $=$ 8.58 cents.

Returning to Solution (b), we found that the power required was 31.52 kw. and, since the heating was completed in one hour, this is 31.52 kw.-hrs. Then, the cost is 31.52 x 2 cents or 63 cents.

If it is desired to solve this problem by metric units (and a knowledge of the metric system is very useful), we would proceed as follows: 100 gallons of water contains 378.54 liters (1 gallon is 3.7854 liters) and weighs 378,500 grams. 110 deg. F. equals 61.1 deg. C.; 378,500 $\times$ 61.1 $=$ 23,126,350 calories; then, $EI = \frac{23,126,350}{3600 \times 0.24 \times 0.85} =$ 31.5 kw.-hrs., which, at 2 cents per kilowatt-hour, costs 63 cents.

The next article in this series will treat of the current-carrying capacities of large conductors as specified by the National Electric Codes and of smaller wire gauge systems.

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THIS MONTH . . . Effect of Polishing on Protective Value of Plated Coatings . . . Spot-Welding Aluminum Coated Steel . . . Selection and Application of Organic Finishes . . . New Economy in Spent Pickle Liquor Treatment . . . Porcelain Enamel Possibilities . . . Dyed Aluminum.

Effect of Polishing on Protective Value of Plated Coatings

THE question of whether the "finish" of steel prior to electroplating affects the protective value of plated coatings is one of widespread interest to engineers, designers and finishing experts dealing with the fabrication and production of a great variety of iron and steel products. To determine this point for plated coatings such as nickel-chromium, practical tests were carried out by the National Bureau of Standards in cooperation with the American Electroplaters' Society, the results of which are reported in April issue of the "Journal of Research," National Bureau of Standards (RP1645), by G. A. Lux and Wm. Blum.

These studies concerned the controlled thickness plating with copper-nickel-chromium and nickel-chromium of steel specimens on which the degree of polish varied from that produced with a very coarse abrasive (90 grain) to the so called "superfinish." The test specimens were then exposed to the atmosphere at New York, N. Y.; Sandy Hook, N. J.; and Washington, D. C. The extent of the rusting observed at periodic intervals of inspection was expressed on a numerical scale and the average results over a period such as one year were finally expressed as "percentage scores."

For most decorative plating it is customary to produce a bright finish. The results of these studies recently reported are of particular interest in view of the fact that the copper-nickel-chromium combination is among the most widely accepted of common decorative

plating procedures. Also of interest to the finishing engineer was the finding that exposure panels with buffed copper under bright nickel were distinctly better (+21%) than those with bright nickel of the same total thickness applied directly to the steel, and were equal to those with buffed dull nickel of the same total thickness.

No conclusive evidence was obtained of a consistent effect of polishing or surface finish on the protective value of the plated coatings on cold-rolled steel. For example, it was pointed out that with 0.00075 inch of buffed dull nickel followed by 0.00001 inch of chromium eight sets ranging from a 90-grain finish to a "superfinish" showed no variations as high as 5 per cent from the average of the three locations. No significant effects of polishing were observed with seven similar sets plated with bright nickel and chromium. No significant effects of polishing on corrosion resistance was noted in test samples from which different depths of metal were removed from the surface but having the same final polish. Varying the cleaning procedure had no significant effect on the life of the coatings so long as adherent deposits were obtained. The results show a consistant increase in the protective value of the coating as the thickness of bright nickel or of copper plus bright nickel was varied from 0.0004 to 0.00125 inch. This confirms what has been found in other exposure tests.

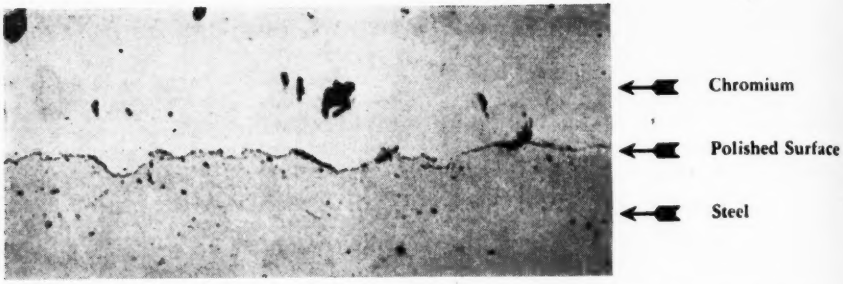
It has been generally believed that plated coatings of a given thickness are more porous and hence less protective when applied to rough surfaces than to smooth or highly polished surfaces. This belief was not borne out by this recent work of Lux and Blum and these experimenters point out several causes that may have contributed to this apparent contradiction. The steel used in the study was cold-rolled and the surface was free from oxide or scale such as is normally present on hot-rolled steel. It was also reasoned that a given polishing scheme might not leave as continuous a metal surface on hot-rolled steel as on the cold-rolled used in this study. The steel used was of a type that might possibly contain less foreign inclusions than other grades of steel, especially hot-rolled. The buffing operation employed on the dull nickel test panels was probably of a type that removed less metal than that normally carried out in commercial decorative plating to "cut" and "color" the nickel to produce a smooth bright surface.

This report by Lux and Blum presents timely information of value to the production man dealing with steel fabrication and finishing at a time when reconversion interest is developing in bright nickel-chromium plating.

Aluminum Coated Steel Can Be Spot Welded

Of interest to designers and fabricators is the report that aluminum coated steel, a product of considerable interest, can be satisfactorily spot welded in production procedures. The research work was carried out at the University of Texas as a part of the M. S. Thesis of H. W. Brown (at present with Hughes Aircraft Co., Mar Vista, Cal.). Aluminized steel consists of steel base coated on both sides with a thin layer of aluminum. Primary advantage of the product as a material of construction is its high resistance to atmospheric corrosion, resistance to heat, and ability to withstand moderate forming and drawing without peeling of the coating ("The Iron Age," Apr. 26, 1945).

A summary of the welding characteristics and conditions developed in Browns' research is given below:



Photomicrographic cross section perpendicular to direction of polishing, X 500. Steel specimen polished with wheel headed with 120 grain
("*Journal of Research*," *National Bureau of Standards*)

Tip shape—2-inch radius dome tips on both top and bottom.

Surface Cleaning—Removal of dirt, grease, and oxide film desirable but not necessary.

Tip pressure—700 pounds.

Current—18,000 amperes.

Average Shear Strength—1,800 to 2,100 pounds.

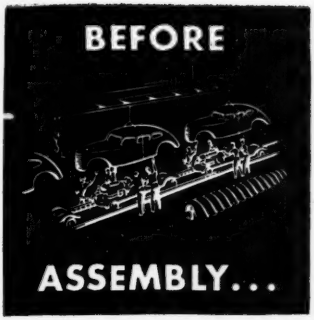
Salt spray tests carried out on typical welds by Boeing Aircraft Company ("The Iron Age," Apr. 26, 1945) showed the effect of existing corrosion in the vicinity of the welds to be negligible as far as strength of welds was concerned.

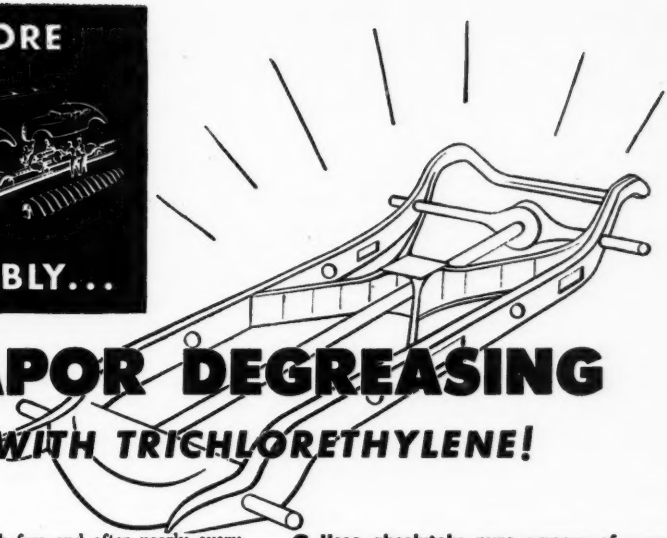
Many Factors Enter Into Application and Selection of Organic Finishes

In addition to the sales-stimulating appearance of an attractively finished metal product, the matter of durability is highly important if the product is to continue to give satisfactory service over a long period of years. The task of the metal stamper and finishing engineer during the past few years has been to manufacture and finish the tools of war. While the protection and camouflaging of instruments of war like tanks, trucks, gunmounts, combat planes and war ships are a long way from the protection and decoration of pressed metal products like automobiles and refrigerators, many of the problems in the application and selection of organic finishes are similar.

Some of the important production considerations of organic finishes have been discussed by C. R. E. Merkle in the May 7, 1945 issue of "Steel" magazine. The problems encountered usually center around such factors as (1) choice of metal, (2) preparation of surface, (3) method of application, (4) drying conditions, and (5) the kind of finish selected.

One of the chief problems presented in organic finishing of steel is corrosion which necessitates careful metal preparation and the use of proper finishes for protection. The corrosion resistance of steel is sometimes improved by coating with protective metals such as zinc, cadmium, lead, tin, and so on. The most important coated metals in this category are zinc coated—the zinc being applied by hot dipping or electroplating. An article of considerable industrial interest is thin electroplated zinc sheet, and there are a number of coated sheets of this type on the market sold by various steel companies under such trade names as Cold Rolled Paint Grip, Paintlok, Bethanite, Weirzin, and others. Zinc surfaces present a very definite adhesion problem. Most manufacturers





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of zinc coated sheets recognize this and supply treated metal where they know finishing is required but it is important to determine this point where the use of finishes is involved.

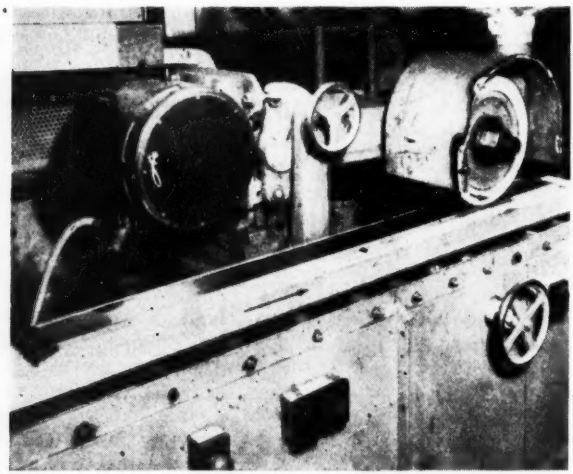
Various factors usually determine the method of application of organic finishes. Among the methods of application may be any of the following: (1) spray—either hand or mechanical, (2) dip—large or small dip tanks, (3) flow coat, (4) roller coat, and (5) brush. Spraying is most generally used, although there is considerable loss due to atomized finish that does not reach the object being sprayed. Dipping, flow coating, roller coating, and brushing are not subject to the type of loss of material as in spraying but use is largely dependent on factors such as size, shape, weight, and contour of the object.

For drying conditions of organic finishes, it is necessary that a certain minimum of air be circulated around the finished surface to carry off solvent vapors and to provide oxygen for oxidizable finishes, regardless of whether the finish is air dried, force dried, or baked. Failure to provide sufficient air can result in films of low gloss caused by trapped solvent or soft films due to insufficient oxidation. The type of baking operation to be used is governed by the principle of heat transfer involved, such as convection, radiation, or induction. Convection and radiant heating are the methods principally used. In all baking of finishes on metal parts, the metal temperature and not the oven air temerature is the governing factor. This applies equally to both radiant and convection ovens.

A "balanced finish" should be selected in which an outstanding property in one characteristic is not gained at the sacrifice of other properties of equal importance. Many factors require consideration in selecting finishing systems for such uses as refrigerators, washing machines, stoves, automobiles, kitchen cabinets, electrical equipment and agricultural machinery. Foremost, the property characteristic pertinent to the use of the finished article should be brought to the highest possible level of performance.

Treatment of Spent Pickling Liquors

The removal of the oxide film from steel preparatory to further processing or electroplating is usually accomplished by pickling the metal in a sulfuric acid bath. This treatment results in a waste liquor which is substantially an aqueous solution of ferrous sulfate and sulfuric acid. Many steel companies and production



Polishing machine used in studies at the National Bureau of Standards

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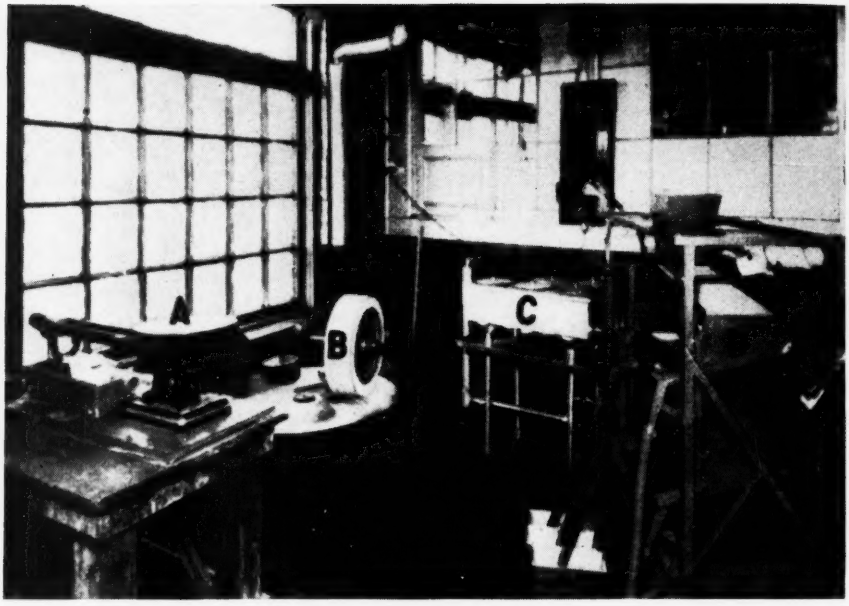

Equipment used in studies at the National Bureau of Standards for preparing abrasive wheels. A—scale; B—heading machine; C—glue heater; D—grain grader

departments can dispose of this liquor only after treating it with lime to neutralize the free acid and precipitate the iron. Lime treatment of waste pickle liquor is expensive; sometimes the cost of disposing of the spent liquor is as great as the cost of pickling. Under these conditions it is essential that the treating agent be utilized as effectively as possible.

A comprehensive report on work carried out at Mellon Institute, Pittsburgh, Pa., to determine the most efficient method for treatment of spent pickling liquors is given in the June, 1945 edition of "Industrial and Engineering Chemistry," published by the American Chemical Society. The paper was written by R. D. Hook, C. J. Lewis, and W. W. Hodge and is entitled "Treatment of Spent Pickling Liquors with Limestone and Lime." Among significant facts brought out in the report is that substantial economy in pickle liquor treatment can be realized by using pulverized high-calcium limestone to neutralize free acid and precipitate part of the iron, and lime to complete the treatment. Production executives concerned with finishing of iron and steel products in which the disposal of waste pickle liquor is involved may profit by study of this report.

Porcelain Enamel—A Finish With Many Possibilities

The dominant factor in the selection of a finish for any product is that its characteristics relative to the everyday use of the finished article be brought to an acceptable high level of performance. Porcelain enamel, in its early history looked upon

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With BuXited wheels, sintered carbide and other superhard metals and alloys can be successfully ground under ordinary shop conditions — and with remarkable economy in life of tools, due to improved finish, cleaner grinding, and elimination of excess heat. BuXite-Processed wheels grind the shank and the carbide at the same time without "loading"—thus saving extra operations.

BuXite wheels give equally good results on tool steels, cast iron, brass, all metals — in precision grinding, form grinding and snagging. In snagging, the increased production speed which is possible requires less dressing — therefore, you can turn out more work with less effort.

BuXite is now obtainable in all "Bridgeport" wheels. Consult us on your grinding problems. Share in the benefits from this greatest single advance in grinding wheel practice in the last twenty-five years!

BUXITE -- A DEVELOPMENT OF CONNECTICUT RESEARCH FOUNDATION IS EXCLUSIVE WITH

THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC., BRIDGEPORT, CONN., U. S. A.

Bridgeport

GRINDERS • GRINDING WHEELS • BUFFING LATHES

largely as a decorative finish, is now widely accepted as a durable protective finish for such articles as stoves, refrigerators, washing machines, and metal sanitary ware. Porcelain enamel on stoves affords color stability at high temperature; on refrigerator exteriors and interiors it offers resistance to condensed moisture, is easy to clean and not easily stained by most foods. Its resistance to thermal shock plus the extremely smooth surface it presents makes it a suitable finish for washing machines. Its ruggedness and strength make it ideal for sinks, basins, and so on.

In a presentation before the 47th annual meeting of the American Ceramic Society ("Ceramic Industry," May, 1945) F. L. Meacham gives some points which are of interest to the production man interested in the possibilities of porcelain enamel finishes. Drawn steel sheet is gradually replacing cast iron as base metal for many applications. Recent developments include super-opaque cover coats, highly opaque acid-resistant cover coats that are easily worked at normal firing temperatures, good acid-resistant single coats, ground coats, and ground and cover coats that can be fired at the same time, thus eliminating a second firing. The enamelers' goal of a white one-coat enamel is becoming more and more a production possibility. It depends on good metals that give off a minimum of gases upon heating. Other developments include enamels with good adherence and reflectance that can be applied in thicknesses under 0.007 inch, and better general procedures for obtaining uniform high quality output.

Some of the considerations necessary for good enameling are:

(1) The enamel coating should be continuous to afford complete protection.

(2) The enamel should have sufficient color and reflectance to present an attractive appearance.

(3) The enamel should be as thin as possible in most instances since thinner applications are less susceptible to injury. Until recently, thicknesses of 0.018 to 0.025 inch were necessary to obtain a reflectance of 72 to 75 per cent. With super-opaque enamels the same reflectance is obtained with thicknesses of 0.008 to 0.014 inch.

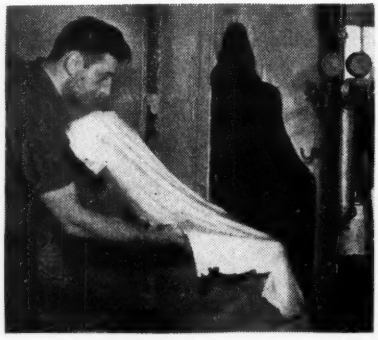
(4) If the enamel is to be subjected to salt atmospheres, an acid resistant enamel should be used.

(5) Proper consideration should be given to the composition of the enamel and the prearation of the metal to ensure a good bond.

Dyed Anodic Coatings on Aluminum

The vast demand for aluminum and its alloys by the aircraft and other allied industries manufacturing for war has resulted in an enormous expansion in production facilities and

Clean Spray Booths



Spray BOOTHCOTE on clean booth.
Paint peels off in sheets.
NO SCRAPING—SAVE TIME and LABOR
Trial offer 5 gal. $5.50 F.O.B.
Used by 2000 leading manufacturers.
MONEY BACK IF NOT PLEASED.
Write for Circular.
BOOTHCOTE DIV., HARRIS SOAP CO.
19 Stetson St., Buffalo 6, N. Y.

HEATING AND COOLING CONTROLS

Low cost - High accuracy

From high speed copper to chrome, and anodyzing to cleaning and rinsing tanks, Sarco has a complete line of temperature controls. The cost varies according to the problem involved, but for the purposes illustrated the simple, inexpensive Sarco LSI Electric Control will do the trick.

It combines accurate temperature indication with automatic control. It is used extensively for both heating and cooling because it costs less, is more reliable and because of the easy adjustment by thumb screw and the built-in dial thermometer.

This is only one of the many Sarco plating controls which range from the low cost Sarco Thermoton, for approximate control of cleaning and rinse tanks, to the highly accurate TR-21 regulator used on many automatic plating operations.

Our representative can show you how others have solved plating problems similar to yours.

49

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Represented in Principal Cities

SARCO Saves Steam

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availability of this metal. Consequently, large quantities of aluminum fabricated products are finding their way into the plating room for chemical treatment and finishing. Among the most important of these treatments is anodizing which simply involves the formation of an oxide film on the surface of the metal by electrochemical means, usually by means of an acid bath with direct or alternating current.

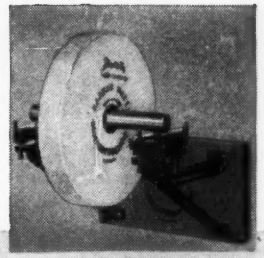
Films of aluminum oxide, which comprise the anodized coating, can be readily colored by means of organic dyes or inorganic mineral pigments ("Proc. Electroplaters' Soc.," 1944). Thus, by immersing in suitable solutions, anodized aluminum may be colored or dyed in an attractive manner. The selection of dyes is almost unlimited and a wide color range is available. The so-called "miracle" of dying aluminum is merely a new application of an old process, the principles of which have long been well understood, at least from the practical viewpoint. In the textile industry, where before the advent of substantive colors for dyeing cotton directly, mordants such as aluminum acetate were used exclusively on cotton goods. The cloth, for example, was boiled in a solution of aluminum acetate which resulted in the precipitation within the fiber itself of a hydrated aluminum oxide which then reacted with the dye in a subsequent operation to produce the desired color effect. Thus, similarly the hydrated oxide of aluminum on the anodized surface reacts chemically with the organic dye to form a color lake. Black dyed anodic coatings on aluminum have found application in the manufacture of aircraft motors, instruments, binoculars and other products where a black corrosion resistant finish is desired. The so-called mordant dyes have been used most effectively, but all other basic or acidic dyes which react favorably with hydrated aluminum oxide may be utilized. In choosing the proper dye, fastness to both sunlight and artificial light and the effects of perspiration, heat and chemicals are some of the factors to be considered besides actual color. In cases where extreme durability of color is of primary importance, inorganic pigments may be used since they appear to be less susceptible to fading and other changes. Like many other finishes, the life of dyed anodic coatings can be extended by the use of protective coatings such as wax and lacquer.

In many cases, the character of the dyed anodic coating may be altered, depending on the surface condition of the aluminum before treatment. Highly polished metal will produce a glossy and lusterous surface with high light reflectivity, while a rough surface will produce a correspondingly flat coating. Bright or polished surfaces may be produced by ordinary buffing, taking precaution to use a buffing compound, easily removed in the subsequent cleaning operation.

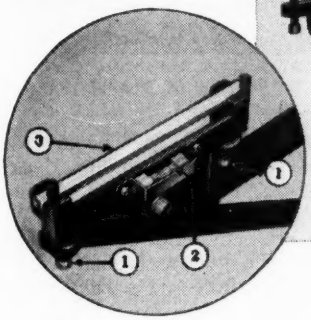
Flat or non-reflecting surfaces are obtained by sandblasting or etching. Hot caustic soda solutions etch in a few seconds to produce coarse grained surfaces that are attractive in certain applications. Hot soda ash solutions require more time, are easier to control, and produce a finer grained surface. There are special means for producing various decorative effects. For example, a finish simulating wood might be obtained by rolling the aluminum sheet between rolls engraved to imitate the grain markings of wood, anodizing, and dyeing. This finish has been suggested for aluminum air-conditioning cabinets and similar applications. A variety of decorative designs may be produced by engraving, etching, or sandblasting prior to anodizing. These unique color effects obviously present many possibilities to manufacturers and designers working with aluminum.

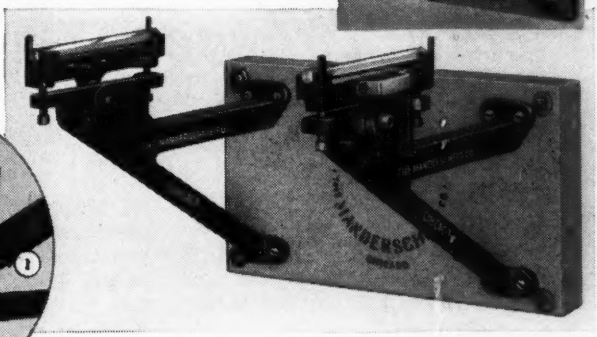
Presto Balancing Ways *for* POLISHING WHEELS

Another MANDERSCHEID Development of incalculable benefit to metal polishers



1. Screws for leveling WAY
2. Spirit level attached to WAY
3. Edge, ground and honed





Here is the Static Balancer metal polishers have long awaited. Developed to give the highest degree of accuracy with durability and ease of use. Arranged for convenient out-of-the-way mounting on wall or post.

Quality built for precision balancing throughout. The WAYS are deep hardened steel, ground and honed to razor straight balancing edges. Each WAY is equipped with spirit level and finger tip precision levelling adjustment. No bearing friction—no hidden members — the utmost convenience and sensitivity is assured.

Reasonably priced — durably built — designed for Polishing Wheel balancing.

Ask your Jobber or write for particulars.

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that effect big savings for
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Send for MANDERSCHEID Bul. 102 on Polishing Room Accessories

The MANDERSCHEID *Co.*

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Serving the Metal Finishing Trade over 35 Years.

Who Are Your Customers -- and Where?

WILLIAM E. HILL

By WILLIAM E. HILL*
as told to Burr Price

THINKING at the current moment places emphasis on the fact that anyone and everyone will buy the output of American industry in the immediate future, pent-up demand being what it is. Production, therefore, is the main concern. But unfortunately, it will not always be that way and accordingly this is a splendid time in which to take advantage of a period of easy distribution to study its basic principles, to provide for progressive advancement of efficiency and for reduction of hit-and-miss methods in marketing.

The long-range problem of sustained production at a level which will adequately maintain our national economy will be answerable by our ability to understand and master the real issues involved: the development of a distributive system which before the war handled only $82,000,000,000 in goods into one capable of supplying customers with $160,000,000,000 in products. We readily handled distribution of our enormous war production because a great proportion of it went to one customer—the government, but the eventual challenge is to meet the wants and needs of millions of customers.

This challenge can be met, distribution can be made to equal our productive capacity if the same analytical and creative methods are applied to distribution as have been applied to production in the past. Engineering methods can develop new distribution to handle new production. This will mean a shifting of emphasis from product research, on which industry has spent vast sums, to distribution research, which has lagged pitifully far behind. Facts thus scientifically found must then be realistically faced by management if our huge job-making production and consumption goal is to be achieved.

What Is Distribution?

Distribution, as defined at a meeting of the Committee on Distribution of the American Society of Mechanical Engineers (of which Fenton B. Turck, Mr. Hill's associate, is chairman), is:

*Mr. Hill is a partner in the firm of Turck, Hill & Company, New York industrial engineers. The work, the writings and public addresses of these men on the application of engineering principles to product marketing have given American business a new appreciation of the importance of factual analysis as a means of gaining knowledge about old customers and where and how to locate new ones.

The total of all activities involved in the progression of goods from producer to the consumer. It includes warehousing, transportation, wholesale and retail marketing, advertising, and a substantial part of research, engineering, accounting and finance.

In the light of this, an analysis of distributive procedure capable of developing full sales opportunities would have to produce answers to such questions as the following:

1. What new products will my company make in our expanded plant?
2. To what new people am I going to sell these new products?
3. Does my overall sales policy make sense to everyone in the organization?
4. Have we built up our sales personnel?
5. How many of my customers are really permanent, and what can I do to get more "repeat" sales from XYZ Company?
6. Will my sales plan increase operating profit despite the many adverse cost factors?
7. Can I boost sales by altering pricing policies?
8. Am I duplicating services that we pay distributors to render? If so, what outlets should be discarded?
9. Have I improved the merchandising of my own sales organization and of my distributors?
10. What are my chances of developing profitable exports?

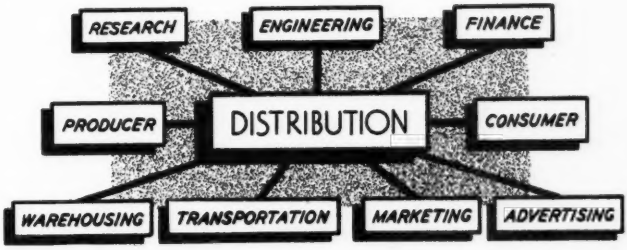
By the employment of modern engineering practices to obtain the facts which will answer such questions, a simple but highly-desirable result is achieved; namely, wasteful hit-or-miss practices in distribution are eliminated. And it is these practices which clutter up the economic highway between the producer and the consumer.

Customer Development

Possibly the most pernicious waste of company funds is the solicitation and servicing of unprofitable accounts. Money is wasted to obtain this unprofitable business; money is wasted as long as the account remains active. Money is likewise wasted by allowing established customers to slip away and by failure to develop each customer to a natural potential.

Every successful salesman in the industrial field accumulates over a period of years a great deal of information through his selling experience. Diamond Jim Brady with his dominating personality was the arch type of personal salesmanship. Every company has one or more successors to this tradition. But today, a sales department needs a great deal more information than can usually be accumulated through the direct selling activity of its organization.

A machinery salesman receives a hot tip that a certain company needs new equipment. He makes his plans, starts his campaign. But one primary fact that the sales management should know is to be found in the



Sketch illustrating the meaning of distribution as defined by Committee on Distribution of American Society of Mechanical Engineers

balance sheet of the prospect. Has the company free credit available? If not, the salesman's efforts will likely be wasted.

There are literally dozens of such facts which have a direct bearing on the selling of important accounts. The most efficient, experienced salesman has neither the time nor the facilities to accumulate, record and interpret the web of information that is needed to handle successfully customers and prospects in the light of today's competition. To achieve real scientific marketing, top management must utilize engineering research methods. It is not sufficient merely to add a few file clerks at the home office to accumulate "hit-or-miss" information sent in from the field. The time is rapidly approaching when the struggle for new business and the retention of valuable accounts will make this painfully evident in the balance sheets of those companies who fail to recognize this fact.

In our business of analyzing companies as desirable prospects, we must know all the facts, and here is the procedure used in obtaining knowledge of customers:

1. A detailed survey is made to determine annual consumption by the prospect of the seller's product, and the prospect is not solicited if there is no chance for mutual profit.

2. The seller investigates the prospect's current sources of supply.

3. A study is made of the prospect's organizational setup, including general policies, direct and indirect affiliations with competition, banking and trade affiliations.

4. With this background information, procedure for the sales force is developed.

5. When it is decided that the prospect would be a profitable customer, a solicitation is made, and, after an order is received, a record of dollar and quantity volume of sales is set up.

6. If possible, a record is also made of the prospect's dollar and quantity purchases from competition.

7. Analyses of lost business are made from studies of data obtained in steps 5 and 6.

8. Policy in following up each customer, frequency of salesmen's calls and the need for special service are determined by the findings of the lost-order analysis.

9. Data also provide a constant check on the relative efficiency of salesmen.

The cost of obtaining advance information entailed in the procedure outlined above has been proven to be justified by more efficient distribution with lowered costs and by testimonials from customers that they prefer to do business with sellers who operate on these sound principles.

Corporate Accounts

Engineering principles can also be applied to the development of corporate accounts which many companies have neglected although this type of business has an intrinsic repeat value that should make it worthy of special consideration. A study was made of twenty companies having a preponderance of corporate accounts and was contrasted with data on twenty other corporations whose sole interest was in dollar-volume business. The latter were shown to have suffered greatly with each slight recession in trade conditions, while the former have maintained a steady growth.

Procedure here is a thorough study of product and service requirements of each account by management and sales force, and each account is treated as an individual distribution objective where the long-term advantages appeared to justify such an

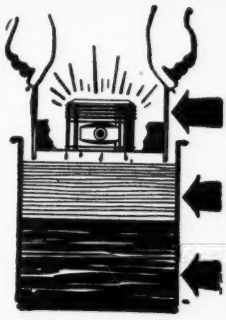
GUNK H. S. DUNK

FOR CARBON DEPOSITS, OIL VARNISH, CLOGGED OIL LINES
FUEL PUMPS, CARBURETORS, OIL COOLERS, FUEL INJECTORS

GIVES A COMPLETE STRIP
— not a strip tease

HARMLESS TO ALL METALS
Tough on Tar, Carbon

GUNK has been doing an outstanding job for the Army and Air Forces — exceeds latest Government degreasing and decarbonizing specifications. Comes ready to use with patented dunking screen in 5 gal. container — a complete decarbonizing package outfit.



GUNK Dunk is easy to use

The dunking screen that comes with the kit.

The hydro-seal—a water base blanket that forms on top like cream on milk and prevents evaporation of concentrate, rinses work.

GUNK (H-5) DUNK, digests carbon, gum.

THE CURRAN CORP.

Manufacturing Chemists

MALDEN 48, MASS.

Makers of:

GUNK-Spray, *self-emulsifying solvents.*
GUNK-Dunk, *carbon gum digestant.*
MOTOR-FIZIK.

HOW TO BUY . . . ASK YOUR JOBBER SALESMAN
or Use Self-Service Coupon for Express Shipment

THE CURRAN CORP., Malden 48, Mass.

Not in stock at my jobber . . . attached to my business letterhead is my check or M.O. on the condition that you ship me by FAST PREPAID RAILWAY EXPRESS a 5 gal. size GUNK H-S Dunk-Kit at dealer's net cost—$9.90 (add 10% west of the Mississippi).

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Firm_____

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effort and expense. The sales department is adjusted so that one person may service an account in any part of the country regardless of sales territories, and all departments cooperate in the establishment and maintenance of each corporate account.

Market Forecasting

Every company makes some effort to forecast probable demand, but few do this vital work on a scientific basis which is capable of reducing production costs, stabilizing employment and increasing profits. This calls for complete factual and independent information, adjusted periodically to changing rate of sales, inventory and other pertinent influences. It has been accomplished by minute checks on performance in every outlet with standard accounting systems in all outlets as a key necessity. Each outlet reports its sales and inventory three times a month, and these reports are summarized and forwarded to the head office. Every ten days management knows how many units were sold in the previous period and how many are in stock. By knowing the current rate of sales and the normal seasonal movements, future sales may be forecast for the remainder of the year. This forecast governs weekly shop production, orders to vendors, financing and marketing procedure.

Product Development

Scientific approach to the question of product development is an essential in guarding against impetuous venturing into new fields, which often greatly increases distribution costs even to the point of menacing company stability. Through the analysis of existing markets for the proposed product, current and projected volume, pricing trends and the distribution procedures of the principal companies in the new field, a complete picture may be obtained which would be the basis for final decisions.

Foreign Distribution

Companies planning to enter the export field in the postwar years will find that distribution of goods in foreign markets will respond to engineering techniques as readily as domestic sales, since American procedure is utterly inadequate abroad and second-hand copying of English and Dutch methods is equally insufficient.

Basic elements of a foreign distribution policy are contained in the experience of one American company which obtained stability and success over a long period of years, and, although this company was a very large one, the several factors in its profitable operations may well serve as a guide to others who contemplate expansion beyond the seas. These basic elements may be summarized as follows:

1. Recognition that manufacture of the products should eventually take place in the consuming country.
2. Management must be native to the country with complete authority as soon as suitable personnel can be trained to administer the business.
3. Adaptation of the design of the product to the consumer demand of the country.
4. Establishment of a strictly graft-free procedure throughout the operations of the country.
5. Creation of one trading center to sell in countries in which manufacturing facilities are not justified, purchasing products from subsidiaries in other countries offering lower cost.
6. Strict maintenance of the independence of each national unit, limiting American supervision to two overall advisers with several traveling auditors.
7. Allowing capital participation where the national laws so decreed or good-will factors made it advisable.

PEACETIME PRODUCTS

• AUTOMOBILES • TRUCKS • REFRIGERATORS
• WASHING MACHINES • RADIOS • METAL HOUSEHOLD APPLIANCES • FARM IMPLEMENTS AND COUNTLESS OTHER PRODUCTS CONSTRUCTED OF STEEL AND ALUMINUM

REQUIRE THE UTMOST IN PAINT PROTECTION

210-A DEOXIDINE

Assures Proper Cleaning and Conditioning

NECESSARY FOR PAINT PERMANENCE

War Materiel—cleaned and conditioned with products and processes developed by the ACP Laboratories and Technicians—was successfully preserved from rust and corrosion when shipped to war zones in every clime, from Arctic cold to the humid Tropics.

These new or improved ACP products and methods are available to peacetime metal fabricators to speed production, lower costs and assure better and more durable paint finishes.

210-A DEOXIDINE has a double action. It removes mill oil, drawing compounds and shop soil from the metal and at the same time prepares the surface properly for finishing.

No unusual equipment is required in this simple process. A three or four stage power washer constructed of mild steel (such as is used with alkalies) may be used.

210-A DEOXIDINE process is simple, economical, effective, and requires a minimum of labor and floor space. Our Technical Department will gladly assist you in making the most effective application of our products to your requirements. Write to Dept. A-11

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Brooklyn, N. Y.

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Van Camp Products & Sales Co.
177 Parliament St., Toronto, Ont.

The consistency of a systematic policy and procedure in regard to native administration for foreign markets had helped the company surmount political upheavals, exchange problems, economic depressions, and even war.

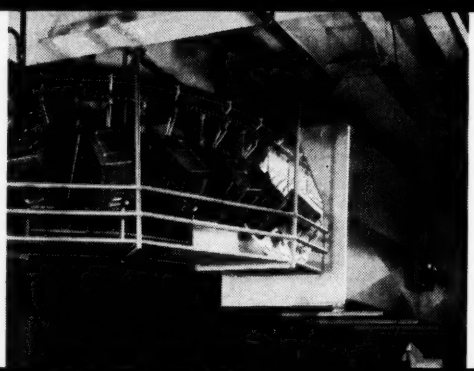
The Job Ahead

Application of these principles of engineering to distribution—the employment of objective fact-finding, experimentation, testing, evaluation, accounting and analysis to establish the principle and policy of a company—has been found beneficial in case after case. It is obvious that not all of the instruments of measurement enumerated above are needed in any single situation, but the application of one or more can undoubtedly be helpful in any distribution problem. It is not just a matter of meeting competition and keeping costs down, but rather of pumping 160 billion dollars worth of products through a system which before the war accommodated roughly 82 billion. The same engineering methods that provided us miracles of production can be effective in the all-important field of postwar distribution.

Zurn Fluid Handling Equipment. The J. A. Zurn Manufacturing Co., Industrial Division, Erie, Pa., has published a 12-page catalog which illustrates and describes a complete line of tested devices for the protection of operating equipment connected with the piping systems utilized in industrial, processing, and power plants. The catalog features suction and pressure line fittings, including duplex vertical and horizontal chamber type strainers, "Y" strainers, angle type strainers, 90-degree offset pressure and 180-degree straight-through pressure strainers, and remote valve control assemblies. Other products described are interceptors for grease, wax, fats, oils, lint, and solids, such as metals, plastics, and so on. Copy of Catalog 45 free upon request.

How OVER-ALL *Even* Paint Baking was *doubly* Assured by JENSEN Ingenuity

AT Grand Rapids Metal Cabinet Company, ammunition boxes, conveyed thru infra-red dry-off and paint-bake ovens, had to be hung *angular fashion* in order to permit the paint to drain from the inside of the boxes. **The problem:** to distribute the heat *evenly* over the *entire* box. **Jensen solved it by:** (1) Shaping the lamp shields to the actual contour of the boxes, themselves, and (2) Employing "dual heat"—a combination of *both* convection and radiant energy heat. **Result:** No discoloration . . . even baking over all! *Write Jensen about YOUR problem today!*

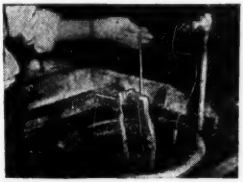


JENSEN SPECIALTIES, Inc. JENSEN 9331 FREELAND DETROIT 27, MICH.

DESIGNERS and BUILDERS of "DUAL HEAT" INFRA-RED OVENS • STANDARD and SPECIAL CONVEYORS

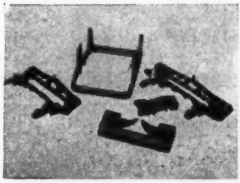
IRIDITE processing at Woodstock Typewriter Company

Automatic or manual immersion... in single racks or in bulk ... for 15 to 60 seconds ... gives lasting Iridite protection.



Foreman at Woodstock Typewriter Co. demonstrates how hot water rinse, which is standard with Iridite, speeds drying.

Iridited parts are easily dried in a few seconds, may be handled, assembled, packed or shipped almost at once.



Builds Sales, Profits by Whipping Corrosion on Zinc, Cadmium, Galvanized

Send for FREE Test Panel

HERE is a fast, sure way to head off corrosion on zinc die cast, zinc or cadmium plated, or galvanized surfaces. Use Iridite—as a paint base or final finish—to make your product better looking, longer lasting and much more salable.

You Be the Judge

Send for free test panel, half of it protected by Iridite and test both halves in your laboratory. See for yourself how Iridite whips corrosion . . . how the Iridite treatment does not alter dimensions of delicately articulated parts . . . how Iridited parts may be cold-worked without chipping, flaking or peeling.

New Uses

Vast new fields are constantly being opened for Iridite. Many large paint manufacturers have approved it as a highly efficient paint base. As a final finish, Iridite is available in a wide choice of attractive colors. Because of Iridite's excellent qualities as a paint base, all colors can be clear-lacquered for even greater durability, greater sales appeal.

Production Speeded

Iridite goes on with a quick dip of 15 to 60 seconds, is easily dried, permits immediate handling, assembling, packing or shipping. What's more, Iridite keeps production moving, maintains automatic machine cycles, needs no special personnel or equipment. Find out whether or not Iridite is the ideal finishing touch for your product. Write today for your test panel. Address Rheem Research Products, Inc., 14811 Standard Oil Bldg., St. Paul and Franklin Streets, Baltimore 2, Maryland.

3 WAYS TO BUILD PROFITS WITH IRIDITE

1 ***As a final finish,*** Iridite is available in a variety of attractive colors.

2 ***As a paint base,*** Iridite holds paint or clear lacquer firmly, even on newly galvanized surfaces.

3 ***To reduce costs,*** consider using galvanized, plus Iridite, in place of more expensive metals.

RHEEM RESEARCH PRODUCTS, INC.

IRIDITE

Standard Oil Bldg., Baltimore 2, Md.

Reg. U. S. Pat. Off.

Branches— 570 Lexington Ave., New York 22; 20 E. Jackson Blvd., Chicago 4; 2411 Sichel St., Los Angeles 31. Distributors in: Waterbury; Grand Rapids; Detroit; Cleveland; Los Angeles; Long Island City; St. Louis.

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RHEEM RESEARCH PRODUCTS, INC.
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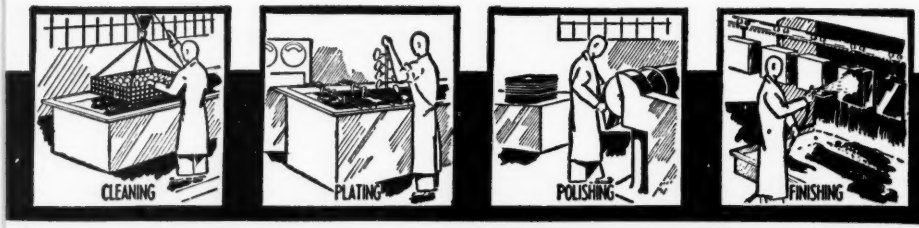
Baltimore 2, Maryland

Gentlemen: Please send me a free panel of Iridite-treated zinc plate for laboratory testing and full information and operating details.

Name.....

Company.....

Address.....



News of the Industry

Appointed Manager of National Accounts for S-W

C. M. Lemperly, vice president and director of sales for The Sherwin-Williams Company, manufacturer of paints and varnishes, announces the appointment of John A. Hornaday as manager of national accounts for the paint organization. Mr. Hornaday, who has had experience in both sales and advertising, has been in the president's

John A. Hornaday

office for the past several years. He is well qualified through experience and contacts with many of the leading manufacturers and industrial concerns in the country to head up this important new work which will be coordinated with similar work in Chicago.

Mr. Hornaday will continue to make his headquarters in Cleveland.

Named Assistant Sales Manager

George H. Tulley has been named assistant sales manager of the Metals Refining Company division of The Glidden Company, with headquarters in Hammond, Ind., David N. Burruss, Jr., division manager, has announced.

Mr. Tulley, a Glidden Company veteran, will devote much of his time to expansion of the division's sales, as well as to the development of new outlets for its products.

Walter T. Justice Joins Dolan

V. J. Dolan & Company, manufacturer of industrial finishes, announces the addition to its staff of Walter T. Justice who, after spending some time in the research laboratories familiarizing himself with Dolan products, will service accounts in the industrial metal-finishing field.

Mr. Justice brings to his new position a wide knowledge of the finishing field gained at the Douglas Aircraft Company during the past 2½ years and prior to that 12½ years in the Chicago Laboratories of the E. I. du Pont Company. During his 2½ years with Douglas Aircraft, he was a finishing engineer at the Park Ridge plant where he supervised the selection and application of finishes used on aircraft.

H-VW-M Adds to Staff

The Hanson-Van Winkle-Munning Co., Matawan, N. J., announces the return of Robert E. Creamer who was formerly in the laboratory in Matawan

Richard E. Waite

and more recently supervisor of plating at the U. S. Naval Air Station at Quonset Point, R. I. Upon the completion of a training course in Matawan, Mr. Creamer has been assigned to the New England territory.

Richard E. Waite, recently in charge of plating and metal finishing at Stromberg-Carlson, is now with H-VW-M. Mr. Waite received his technical training at the Rochester University of Technology and is widely experienced in the plating industry. He has completed a special training course at Matawan and is now in the field, with headquarters at Landing Road S., Rochester, N. Y.

Now Associated with Metalwash

Charles H. Mayer, formerly with the Bridgeport Brass Company, has become connected with the Metalwash Machinery Co., Irvington, N. J., in the capacity of an engineer in the design and development of new equipment for cleaning, pickling, rust-proofing, and drying processes.

Added to Staff

The Hanson-Van Winkle-Munning Co., Matawan, N. J., announces that Paul R. Cutter has joined its staff as an electrochemist. Mr. Cutter received his primary and secondary education in Hugoton, Kan. He received his B. S. in chemistry from the Panhandle A & M College, Goodwell, Okla., and his M.S. in physical chemistry from the Oklahoma A & M College, Stillwater, Oklahoma.

Mr. Cutter has had broad industrial experience in chemical control and research. He previously was assistant chief chemist of Consolidated-Vultee Aircraft Corp., Fort Worth, Tex. For the H-VW-M Company, Mr. Cutter will work on special electrochemical processes.

Osborn Appoints Sales Engineer

The appointment of Robert H. Boyer as sales engineer has been announced by The Osborn Manufacturing Co., Cleveland, Ohio, manufacturer of brushes for industry. Mr. Boyer, who attended Sheffield Scientific School of Yale University, will assist Osborn salesmen in studies of the application and use of power brushes.

In addition to his technical training, Mr. Boyer brings to Osborn 33 years of sales executive experience gained with General Electric, The Chicago Pneumatic Tool Company, The Kent Company, General Floorcraft, Inc., and the Bullard Company. In his latest connection before joining Osborn, Mr. Boyer was engaged in the inspection of precision equipment used in Bullard's manufacturing operations.

Robert H. Boyer

Heads Wyandotte Chemicals Industrial Sales Department

Dr. Roy E. Heath now heads the Industrial Sales Department of the J. B. Ford Division of Wyandotte Chemicals Corporation. Dr. Heath, who assumed his new

Dr. Roy E. Heath

duties November 1, will be associated with W. M. Cole, former head of the department, who is retaining his connections with the company for an indefinite period.

Dr. Heath is a graduate of Albion College and obtained his Ph.D. degree from Western Reserve University where he was a National Carbon Research fellow working in inorganic and electrochemistry. Following one year as a lecturer in chemistry at Western Reserve University and two years as an instructor in chemistry at the University of Wisconsin, he joined Wyandotte Chemicals Corporation as a market research executive attached to the sales department.

Late in 1943, Dr. Heath was granted a leave of absence to join the metallurgical laboratory of the University of Chicago to do fundamental chemical research on one phase of the atomic bomb project. He returned to Wyandotte Chemicals Corporation in the fall of 1944.

Forms Company

Harold Narcus, formerly connected with the Industrial Chromium Corporation and Plating Processes Corporation of Holyoke, Mass., announces the formation of a company, Electrochemical Industries, to be located in Worcester, Mass. This company will specialize in the plating of plastics and other non-conductors and will offer consulting service to both the plastics and plating fields.

Mr. Narcus is widely known in the metal-finishing and plastics fields, having written numerous technical articles on these subjects and addressed several branches of the American Electroplaters' Society. The plating of plastics was the subject of a paper presented by him at the Annual Convention of the A.E.S in Cleveland last year.

Wesley Cassell Joins Lea

The Lea Manufacturing Co., Waterbury, Conn., has appointed Wesley L. Cassell to its technical sales staff. Mr.

Wesley L. Cassell

Cassell will bring to his new duties many years of experience in the technical phases of metal finishing.

For a real good polishing job use

KEYSTONE EMERY

TURKISH — NAXOS — AMERICAN

KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila., Pa.

THOSE plating chemicals do look about the same, but Joe knows the resemblance stops there. The refinements in Harshaw Anodes and Chemicals have given Joe added improvements in his plating, which he fully recognizes.

He knows now that Harshaw guards the purity of their plating materials.

One control of purity, for example, is spectrographic analysis of raw materials, before they are used, then when they are in process, and finally to check the finished product. This investigation helps maintain and protect the purity of the plating chemicals Joe purchases from Harshaw.

Practical plating experience, combined with laboratory control and research, has enabled Harshaw to set the pace in new plating developments which in turn maintain top recognition for Harshaw in the plating industry.

Keep your production up and your scrap pile down . . . place your order with Harshaw for nickel, chromium, copper, cadmium, zinc, tin and lead plating materials. Buy *top performance*.

SEND FOR

- **Lead Plating Booklet of Practical Information**
- **32-page book listing Industrial Chemicals**
- **72-page price list of Laboratory Chemicals**

HARSHAW

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

Augments Engineering Staff

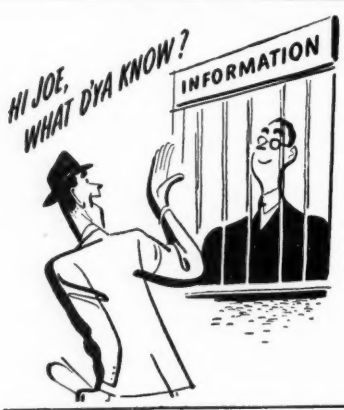
The George L. Nankervis Co., 5408 Commonwealth Ave., Detroit 8, Mich., manufacturer and distributor of plating and metal-finishing equipment, has augmented its engineering staff in order to take care of increased volume of reconversion and new installations of plating and metal-finishing plants in the Middle West.

W. E. Stadel

W. E. Stadel, a graduate of the University of Michigan with a B.S. in mechanical engineering, has had extensive experience in technical supervision of plating, having been associated with Dodge Brothers, Wolverine Pump, McGean Chemical, and Chrysler Corporation for the past 20 years.

M. W. Woodruff, a graduate of the University of Michigan with a B.S. in chemical engineering, has had extensive experience in metal finishing, production supervision, laboratory control and research. His experience over the past several years with the Eaton Manufacturing Company of Cleveland and the Chrysler Corporation of Detroit has fitted him well for his new capacity in the engineering department of the George L. Nankervis Company.

With the acquisition of the above engineers, the George L. Nankervis Company has extended its services whereby it is now accepting general installation work, including the full contract for complete engineering and installation of plating and metal-finishing plants.



WE HAVE ALL THE ANSWERS!

. . . For over fifty years, G. S. Blakeslee & Co. have been engineers of cleaning equipment. Many problems have been solved and many bottle-necks in the production line eliminated with Blakeslee Metal Parts Washers and Solvent Degreasers.

G. S. Blakeslee & Co. would appreciate the opportunity of giving you the information that will help solve your metal parts cleaning problems.

Write for free informative booklet.

BLAKESLEE
Solvent Vapor DEGREASERS
Metal Parts WASHERS

STANDARD AND SPECIALS *Engineered for you*

G. S. BLAKESLEE & CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

Get *Your* Finishing Department in Production FASTER with a complete DESPATCH SYSTEM

FIELD SURVEY

ENGINEERING

PRODUCTION

INSTALLATION

Save weeks or months of delay!

By delivering and installing your complete finishing system *weeks or months* ahead of most schedules, Despatch Engineers offer you a valuable and timely service. **Your products will not only reach the market sooner, but they'll have the kind of finish that only an ultra-modern system can provide.**

WHY PROMPT DELIVERY IS POSSIBLE

To provide fast, competent service like this, particularly in a highly specialized field, requires an unusual engineering organization. Here is what Despatch offers:

1. Largest Engineering Staff in the industry. There are over 110 experienced Resident Engineers and Field Engineers, every one a picked specialist! Offices from coast to coast. Your finishing needs are exhaustively analyzed to the last detail. Assures correct selection, design and performance of all equipment.

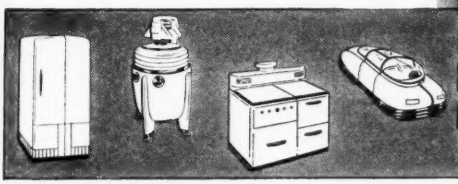
2. Huge Production Facilities with one of the largest, most up-to-date plants in the industry. Ample floorspace, adequate stocks, tools, modern high speed machinery. Streamlined, efficient manufacturing methods. Makes it possible to get *your* job out fast!

3. Immediate Installation After Delivery. Eliminates a common source of delay. Competent Despatch Installation Engineers erect, coordinate and adjust your finishing system units for maximum efficiency in performance.

TAKE ADVANTAGE OF THIS SERVICE!

Our 43 years specialized experience will help you save time, reduce costs and get a complete Finishing System installed in your plant faster.

FINISH BAKING OVENS (Conveyor or Batch Type), SPRA-BONDERIZERS, DRYERS, AIR CONDITIONERS, SPRAY BOOTHS, CONVEYORS



Write or Wire for Details

DESPATCH OVEN COMPANY MINNEAPOLIS 14 CHICAGO 1

DESPATCH OVEN COMPANY
619 S. E. 8 Street, Minneapolis 14, Minn. — 221 N. LaSalle, Chicago 1, Ill.

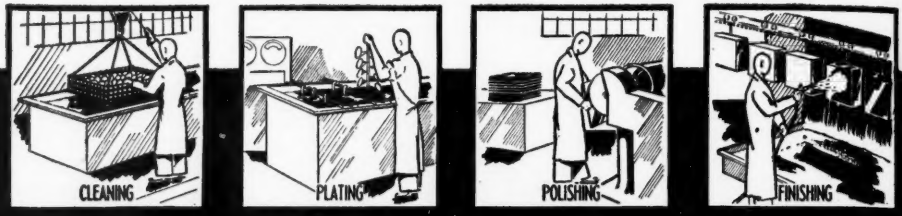
Yes! We're interested in PROMPT DELIVERY of Finishing System equipment, such as:

☐ BAKING OVENS ☐ BONDERIZING UNITS
☐ DRYERS ☐ AIR CONDITIONERS
☐ CONVEYORS ☐ SPRAY BOOTHS
☐ Have your engineers survey our plant and recommend equipment for finishing such products as_____

Name_____ Title_____

Company_____

Address_____
(STREET) (CITY) (ZONE) (STATE)



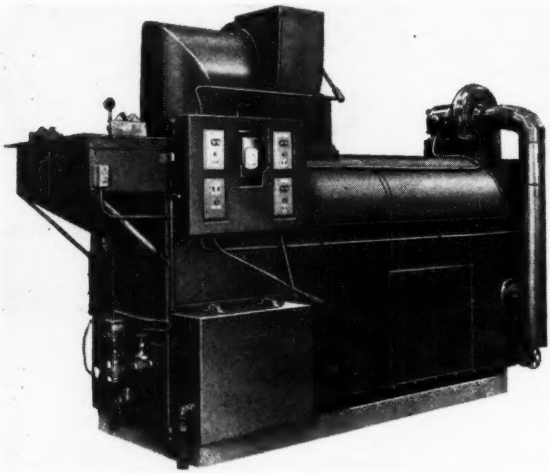
New Equipment and Materials

Optimus Screw-Drum Type Rinsing and Drying Machine

A screw-drum type machine especially designed for the rinsing and drying of screw machine or small stamped parts has been announced by the Optimus Equipment Co., 133 Church St., Matawan, N. J. Versatile in its applications, the machine can be used for washing and drying or rinsing and drying or any part of these operations. It is also adaptable to a wash-drain, rinse-drain, cold or hot air dry operation sequence.

Said to be ideal for very difficult rinsing and drying jobs, the Optimus Screw-Drum Type Rinsing and Drying Machine moreover can be adapted for pickling operations. The air steam passes through a heater and blower, providing for either or both a cold and hot air-blast system. Air loss is said to be eliminated as a result of the completely enclosed dryer end.

The various parts of the machine are readily accessible for lubrication, maintenance, or alterations and cleaning such as might be required in hard water areas. Centralized lubrication may be provided if desired.



Optimus Screw-Drum Type Rinsing and Drying Machine

for Visual Inspection

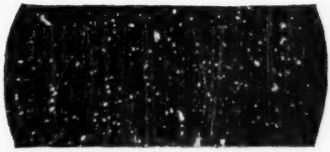
of FINISHED SURFACES

The Master Magnifier Set enables you to step up your normal vision 7 times, 20 times, even 40 times! Each magnifier furnishes its own bright illumination. Use it anywhere—even in the dark!

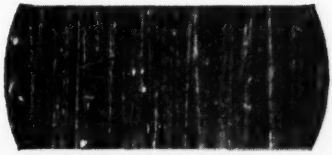
Detect any tendency toward trouble. The information about your processes and finishes that can be obtained with these simple but effective inspection tools will be worth many times their cost.

Illustrations below show the effects obtained by viewing a defective plated surface with these three magnifiers:

As seen with unaided eye.



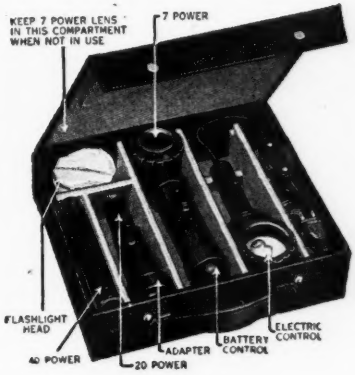
As seen with the 7-Power.



As seen with the 20-Power.

As seen with the 40-Power.

Note the scale on the 40-Power. Each interval is 0.001 inch on the surface inspected.



An assortment of fine magnifiers that bridges the gap between unaided eye and expensive microscopes.

Each magnification has its special uses. With the *complete set*, you are equipped for every inspection problem requiring magnification.

Hundreds of these sets in use, many already in the finishing industry. More complete information on request. Ask for Leaflet PF-44.

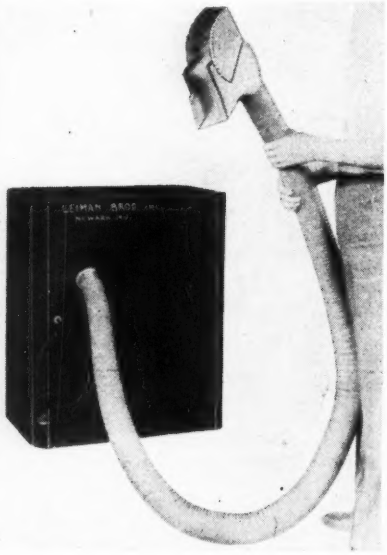
Complete set of three magnifiers, with both battery and electric controls, in portable case $98.50

R. P. CARGILLE

118 Liberty St., New York 6, N. Y.

Leiman Dust Collector

Leiman Bros., Inc., 138-80 Christie St., Newark 5, N. J., announces a dust collector employing the centrifugal vortex principle whereby a powerful air suction draws the dust through a flexible hose and hood provided and into the interior of a cabinet which contains a



Leiman Dust Collector

circular, conical shaped cyclone tank. The rapid spinning of the air forces the dust particles to the center of this mass of spinning air, and its gravity causes the dust to drop into a receptacle where it may be quickly and easily removed.

Since the center of the whirling mass of air provided by the unit is almost pure dust, the outer edge of the mass is said to be practically pure air separated from the dust. And, being free of dust and consequently lighter, the pure air floats out through the fine fiberglass cylinder at the top of the cabinet where it recirculates into the air of the room.

The Leiman Dust Collector is recommended for use in connection with surface and universal grinders, single or double wheel grinders or buffers, sanding wheels or belts, and other dust-creating equipment.

"Ferox" Chemical Rust Disintegrator

"Ferox," a solution that is designed to remove rust mechanically, is now being marketed by Service Industries, Chemical Products Division, 2103 E. Somerset St., Philadelphia 34, Pa. Metal treated with the solution is not only said to be freed of all rust but at the same time to be fortified against further corrosion from atmospheric moisture.

According to the manufacturer, Ferox does not burn, attack, distort, or affect metal or its tolerances and will not burn or stain the skin. Rust stains can be quickly removed from porcelain enamel and plated surfaces by rubbing with a cloth dipped in Ferox. The unusual penetrating power of the solution forces it into all pores, seams, holes, joints, and interstices where it attacks rust vigorously, removing the rust completely without harm to the metal, the manufacturer states. The unusual affinity of Ferox for rust causes it to cling tenaciously to the sides and bottom of round or flat, horizontal or vertical surfaces, holding firmly while the rust is dissolved.

Useful in removing lime and cement from metal as well as rust, Ferox can be applied with a paint brush, mop, scrub brush, or spray gun. For production operations where speed is required, tank dipping is said to be most economical. Used as a hot or cold dip, Ferox, it is claimed, does not lose strength from evaporation and its effectiveness can be sustained over an extended period of time by the addition of water to maintain the original volume.

Simultaneous with the removal of rust and fortifying the clean metal against

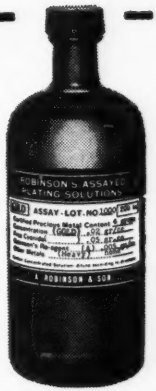
BETTER PLATING, LESS COST!
"MGC" ELECTROPLATING EQUIPMENT
Write for Interesting Details TODAY!
MOTOR GENERATOR CORP., HOBART SQ. PF-11 TROY, OHIO

— PLATERS *and* MANUFACTURERS —

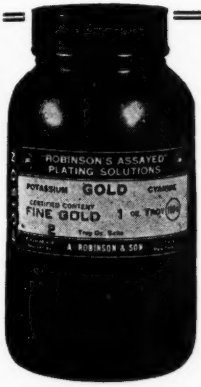
SHOULD INVESTIGATE

ROBINSON'S ASSAYED (100%)

GOLD PLATING SOLUTION



Robinson's Assayed Gold Plating Solutions were the first standardized liquid Gold concentrates. They feature gold by weight—not by the quart. Your plating bath can be continuously operated through convenient replenishment. This assures economy and uniform results. Remember your investment in Robinson Gold Plating solutions is always on the basis of TROY ounces (31.103 grams) and the Gold weights are 100%.



ROBINSON'S ASSAYED POTASSIUM

GOLD CYANIDE

IN SALT FORM

Here's another proven product—fully tested in critical war production and now used by scores of shops on equally exacting civilian jobs. You can depend upon ROBINSON'S Assayed Potassium Gold Cyanide successfully to meet your requirements. And, you get guaranteed Gold weight in TROY—100%.

RHODIUM PLATING SOLUTION

(JOHNSON-MATTHEY)

This internationally known and endorsed Rhodium plating solution—Sulphate-Phosphate—is available at pre-war prices. Your needs can be supplied promptly.

Complete information—without obligation write, wire or call.

A. ROBINSON & SON

Sixty-Six Years in Precious Metals

131 CANAL STREET **NEW YORK CITY**

Canal 6-0310 — 0464

further corrosion from airborne moisture, Ferox creates a chemical bond coat that is an integral part of the metal and to which paint, enamel, lacquer, and various other coatings are said to anchor permanently. Ferox is described as an ideal prime coat for galvanized metal to remove rust spots and to "fix" the surface for paint adherence.

"Easy" Models XL50 and XL90 Reciprocating Electric Sanders

Two new models of its "Easy" Reciprocating Electric Sander, designated

"Easy" Reciprocating Electric Sander

as the XL50 and XL90, are announced by the Detroit Surfacing Machine Co., 7433 W. Davison, Detroit 4, Mich. Each model features a floating pistol-grip handle, rubber mounting, powerful motor, well-balanced design, slide type switch mounted on the side of the handle, and various other improvements.

Described as practically vibrationless, fast cutting, and exceedingly simple to operate, each model provides a straight-line reciprocating action that mechanically duplicates the back-and-forth motion of hand block sanding, rubbing, or polishing. The short rapid stroke of the unit is said to develop but little heat, thus making it ideal for a wide range of finishing applications on plastics, metal, composition, and other materials.

The Model XL90 features a simple snap-action device that permits instant attachment of the correct type of sanding pad for the job. To ensure maximum efficiency on flat, curved, wet, or dry work, pads are furnished of felt, rubber, and other materials of the desired shape, size, and degree of flexibility.

"Gunk Dunk" Carbon Digestant

"Gunk Dunk," a carbon digestant for carbon and paint stripping, is now being marketed by The Curran Corp., Malden 48, Mass. The material provides a water base blanket (Hydro-Seal) which floats on the compound like cream on milk, seals in solvent vapors, and provides an automatic rinsing action.

Said to work satisfactorily when cold and particularly fast when warmed to 140 deg. F., Gunk Dunk is claimed to thoroughly strip gasoline, gums, lead, and paint and to restore both base metal and small brass control screws, jets, valves, and so on, to original factory-bright appearance without loss of dimensions, discoloration, or harmful effects. The material is particularly designed for decarbonizing Diesel injectors, pistons (aviation), oil coolers, cylinder heads, pneumatic tools, oil burner parts, carbonated mechanisms, carbonized bearings, and so on.

Whatever the shape of parts you must protect . . .
There's a Precision DUST CAP and THREAD PROTECTOR!
Protect fittings, exposed openings, ends, coils, forms, etc., inside and outside with these strong, spirally wound fibre safeguards. Most economical.
SEND FOR SAMPLES AND PRICES.
PRECISION PAPER TUBE CO.
2053 W. CHARLESTON ST. CHICAGO 47, ILL.

FUNCTIONAL

Used in airplane, auto and numerous other industries for—

SOUND DEADENING • TEMPERATURE INSULATION • INTEGRAL GASKETS • SHOCK ABSORBING SURFACE • NON-MAR SURFACE PROTECTION.

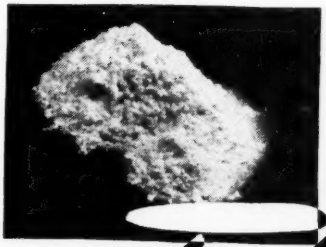
DECORATIVE

Applied in various lengths and colors to wood, paper, cloth, metal, etc., the following effects are produced—

SUEDE LEATHER • FURNITURE UPHOLSTERY FABRICS • AIRPLANE AND AUTO UPHOLSTERY FABRICS • VELVET • VELOUR • MOHAIR.

Check this list of industrial uses for

FLOCK



RAYCO *Flock*

The Surface Coating of 1,000 Uses

Rayco Flock consists of textile particles controlled in manufacture to produce various types of surfaces when adhered to paper, metal, wood, glass, plastic, cloth, cardboard, etc. The above list is merely suggestive—new uses are found every month. Endless variety of colors, wide range of textures: suede leather, felt, velvet, velour, etc. Ample sample gladly sent.

RAYON PROCESSING CO. of R.I. INC.

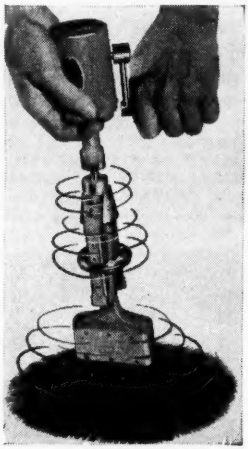
65 TREMONT ST., CENTRAL FALLS, RHODE ISLAND

Developers and Manufacturers of Printing and Coating Flock

"Spin A Brush" Paint Brush Cleaner

Known as the "Spin A Brush," a sturdy compact electrical tool designed for the rapid cleaning of paint brushes, mixing of paint, and so on, and cleaning of stippler covers is now being marketed by the Nashway Co., Ltd., 1401 W. Pershing Rd., Chicago 9, Ill. Easy to use and carry, the tool includes a series wound universal type motor which can be operated on 110-115 volts, alternating or direct current of any commercial frequency—60, 50, 40, 30, or 25 cycles.

Available with a through cord switch which distinctly indicates "on" or "off" or with a regular push switch installed in the tool, the Spin A Brush is finished in chrome and other permanent rustproof materials. The tool weighs 2 lb. 6 oz. and is supplied cartoned in 200-lb. test board.



"Spin A Brush" Paint Brush Cleaner

To use, the paint brush is placed on center in the clamp of the tool and the brush squashed thoroughly in a few inches of clean liquid in a pail, which should be large enough so that the bristles will not touch the sides while spinning. The brush is then lifted out of the liquid, but not out of the pail, and spun for 15 seconds by operating the switch on the tool. The brush is then again lowered and squashed in the cleaning liquid, after which it is lifted out of the liquid and spun 15 seconds a second time, with the brush now being clean.

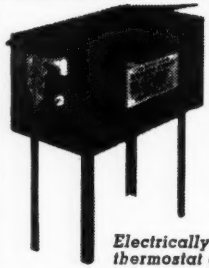
INDIAN BRAND

Polishing Abrasive
Long Wearing

Indian Brand polishing abrasive has been perfected by our engineers as a substitute for imported Turkish Emery.
This new, long wearing, economical abrasive grain, now being used in many leading defense plants, has brought outstanding results to its users.

Send for trial lot—Free.

HAMILTON
Emery & Corundum Co.
CHESTER MASS.



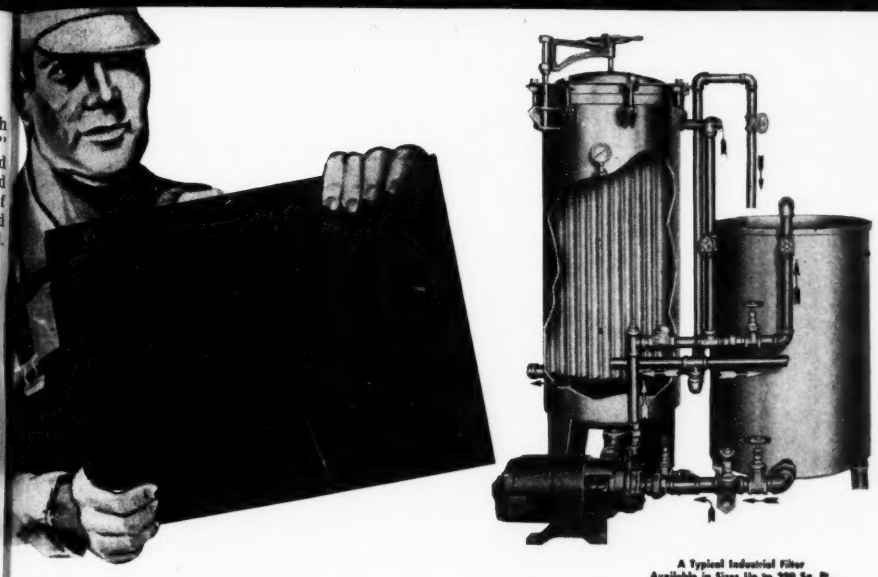
Electrically heated, thermostat control.

COOPER'S VICTORY TANK
For Cleaning Metals—Many Other Uses
(SINGLE AND DOUBLE MODELS)

NOW AVAILABLE! Wire Dipping Baskets, Electric Glue Pots, Wax Heating Tanks, Cold Processing Tanks, Gas Fired Tanks, Ethyl-Cellulose Tanks, Ethyl-Cellulose Compound, Dipping Wax (AXS 1015), Alkali Cleaners, Cleaning Solvents, Rubber Gloves and Aprons, Water Softeners, Rust Preventives, Rust Remover.

D. C. OXIDIZING COMPOUND
(Gun Metal Finish)

D. C. COOPER CO.
20 E. 18th St. Harrison 8047 Chicago 16, Illinois

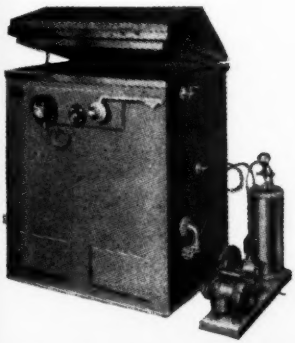


A Typical Industrial Filter
Available in Sizes Up to 390 Sq. Ft.
of Filtration Area

HERE IS GOOD NEWS FROM THE PLATING FRONT!

Industrial filters are now coming equipped with AIRWASH—the new cleaning device that does a thorough job of removing sludge from the filter cloths in a few minutes without opening the filter. You will welcome this new labor saving method of cleaning filters.

Industrial offers the ideal filtration and purification system for use with large installations of nickel, acid and cyanide copper, brass, high speed brite copper, rochelle copper, brite zinc, tin and other plating solutions.
Write us for recommendations covering your needs.



SALT FOG
Corrosion Test Equipment

This modern instrument is designed to meet all requirements of latest "Salt Fog Testing Procedure Specifications" to determine corrosion resistance of plated, coated, lacquered or painted parts.

Serious rejection losses on industrial finishes which must meet Army or Navy specifications are avoided by systematic tests with Industrial Salt Fog Test Equipment.

STANDARD SIZES

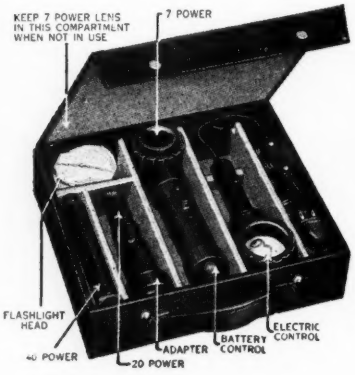
No. 1—48" long 26" wide 36" deep No. 3—30" long 18" wide 30" deep
No. 2—36" long 24" wide 30" deep No. 4—24" long 15" wide 30" deep
No. 6—14" long 12" wide 12" deep

INDUSTRIAL FILTER & PUMP MFG. CO.

1621-25 WEST CARROLL AVENUE CHICAGO 12, ILLINOIS

Cargille Master Magnifier Set

A master magnifier set for the visual inspection of finished surfaces is now being marketed by R. P. Cargille, 118 Liberty St., New York 6, N. Y. The set comprises three magnifiers which are designed to magnify normal vision 7, 20, and even up to 40 times and which pro-



Cargille Master Magnifier Set

vide their own bright illumination, thus enabling them to be used in dark as well as lighted areas.

Uses for the Cargille Master Magnifier Set, which, in addition to the three magnifiers, is supplied complete with both battery and electric controls in a portable case, include the inspection of surfaces for too deep etching in cleaning processes; inspection of coatings for texture, scales, air bubbles, and pinholes; inspection of abrasives and polishing compounds for large particles and uniformity; and inspection of polished surfaces under magnification for scratches and degree of polish.

"Polyplastic" Synthetic Finish

A synthetic finish for washing machines, mixers, vacuum cleaners, refrigerators, office appliances, and other products, to be known as "Polyplastic," is now available from the Standard Varnish Works, 2600 Richmond Terrace, Staten Island, N. Y. Designed to provide lasting protection with brilliant beauty, the material can also be obtained as a unique monobake finish—primer and finishing coat baked in one operation.

According to the manufacturer, Polyplastic is unaffected in color and luster by slight variations in oven temperature. It is available in white and standard colors.

Optimus Deoxidant No. 3

A material for use in removing flux and welding and brazing scale, to be known as Optimus Deoxidant No. 3, is now being marketed by the Optimus Detergents Co., 133 Church St., Matawan, N. J. Not a bright dip and not intended to replace acid in ordinary pickling, Optimus Deoxidant No. 3, being acidic in nature, may, it is claimed, be used on most metals as a mild deoxidant without serious etching of the surface, including welded steel tubing, brazed, hot rolled and cold rolled steel, copper, brass, welded aluminum, cast iron, bronze castings, and most aluminum alloys.

In general, oxides are said to be removed with the formation of very little or no smut using Optimus Deoxidant No. 3. According to the manufacturer, most welding and brazing scales are removed in from 5 to 15 minutes with the material, which produces no annoying or corroding fumes and provides for ease of operation.

Those Perfect Partners For Pickling

NEP and SUMFOAM

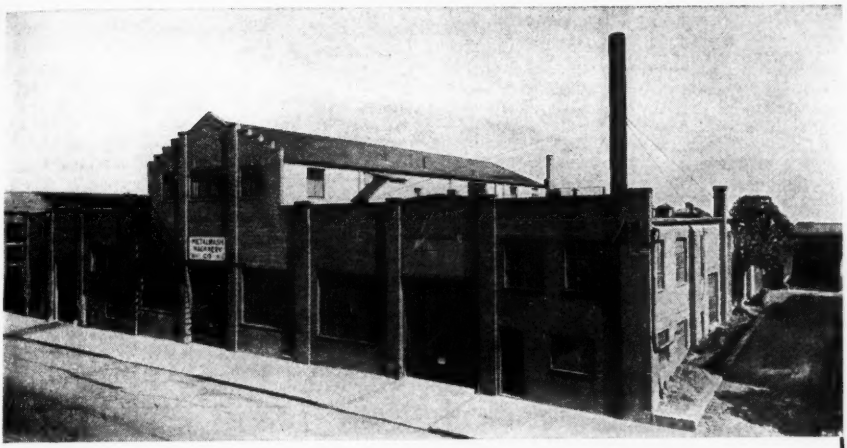
• TO SAVE ACID IN PICKLING •

• TO PREVENT FUMES •

THE WM. M. PARKIN CO. • 1102 HIGHLAND BLDG.

PITTSBURGH 6, PA.

— This Modern Plant produces



Metalwash Equipment for

CLEANING . . . PICKLING . . . RUSTPROOFING . . . DRYING

— for Serving Your Present Metal Cleaning requirements in

Our 23 years experience in designing and building equipment for preparing metal surfaces for finishing, enables us to meet the exacting requirements of today for better, faster and more economical finishing.

— for Solving Your Future Metal Cleaning Problems

We maintain a competent Engineering and Research Staff which is constantly developing new methods and equipment. Our nation-wide sales organization is qualified to assist you in applying these developments to your problems. *Write or 'phone.*

METALWASH MACHINERY CO.

149-155 Shaw Ave. **Irvington 11, N. J.**

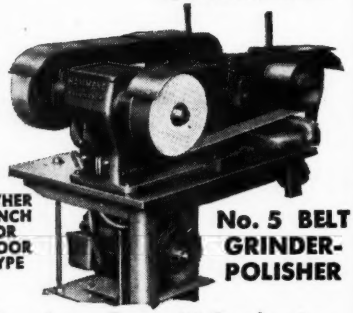
Miccroloid Industrial Maintenance Coating

An industrial maintenance coating for maximum protection against corrosion is announced by the Michigan Chrome & Chemical Co., 6342 E. Jefferson Ave., Detroit 7, Mich. Known as Miccroloid, the material is compounded from thermo-plastic resins and is said to provide a tough, resilient, firmly adhering film that offers unusual resistance to the most severe corrosive conditions.

Miccroloid is recommended for use on plating equipment, acid and alkali rinse tanks, structural steel, factory walls and floors, pipe lines, air ducts, blower equipment, ventilating systems, process piping and tubing, water storage cases, water softening and refrigerating equipment, photo equipment, and so on. It can be effectively appplied to metal, concrete, and wood surfaces.

Said to be most effective where a painted surface comes in continual contact with water or corrosive chemicals, Miccroloid can be softened or dissolved by ketones, esters, aromatic hydrocarbons, and trichlorethylene. Claimed to be unusually resistant to standard gasolines, oils, and aliphatic hydrocarbons, Miccroloid may be applied by brushing, dipping, or spraying in the conventional manner.

Hammond's .... of KALAMAZOO



EITHER BENCH OR FLOOR TYPE

No. 5 BELT GRINDER-POLISHER

For Low Cost, Hi-Production Grinding, Polishing, Buffing, Deburring and Brushing. Write for Bulletin.

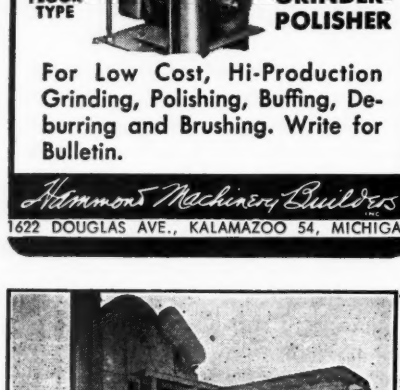
Hammond Machinery Builders INC

1622 DOUGLAS AVE., KALAMAZOO 54, MICHIGAN

Unichrome Dip

Announcement is made by United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y., of a process—Unichrome Dip—which provides a convenient and economical means of obtaining corrosion protection coatings on cadimum and zinc. By converting the surface to chemically inert compounds, either black or olive drab finishes can be produced which are said to prevent the formation of white corrosion products and also provide an excellent base for paint or lacquer.

An outstanding advantage claimed for the process is that parts require only a single immersion of from 2 to 5 minutes in Unichrome Dip. Other advantages cited are that no special equipment, racking, or current is required; parts are handled in bulk and treated at room temperature; and maintenance and control of the solution can be easily effected.



HYDRO-FLOW

INDUSTRIAL WASHING MACHINES

Streamlined design. Recirculating hot or cold air blow off. Hidden motors, pumps and pipes are easily accessible. Piping and nozzles located to insure thorough cleansing of all surfaces. Rugged and efficient pressure pump. Corrosion resistant spray nozzles—from mist to open stream. Handling alkali to varsol as cleaner. Monorail, Belt, or Gravity type conveyors designed to carry any shape or size material. Variable speeds on conveyor drive synchronize production.

INTERNATIONAL CONVEYOR & WASHER CORP.

Write for circular.

652 E. FORT ST. DETROIT 26, MICH.

*CHEMICALS . . . to clean and prepare metal for painting

SOL-KLEAN . . . PHOSPHORIC ACID METAL CONDITIONERS

PREZAINT . . . MAKES PAINT STICK TO ZINC AND GALVANIZED

INDUSTROSOLV . SOLVENT EMULSIONS FOR SPRAY WASHING MACHINES

PHOSMUL . . . . SOLVENT EMULSIONS CONTAINING PHOSPHORIC ACID

INDUSTRO . . . ALKALI CLEANERS AND AIR WASH COMPOUNDS

SEP-COTE . . . . SPRAY BOOTH COATINGS

**Write for informative literature.*

SOL-KLEAN is used to prepare steel and aluminum for painting. Rust, oxides and oil are removed and corrosion producing agents are neutralized by it. Also, Sol-Klean etches the metal and gives it a thin phosphate coating.

For use one volume of Sol-Klean is diluted with 2 or 3 volumes of water. The resulting solution is usually brushed on the metal at room temperature. It adheres to the oily surface, penetrates the oil and mixes with it, and dissolves the rust. Then the Sol-Klean is removed together with the dissolved oil and rust by wiping with rags or flushing with water.

Metal may also be cleaned and treated by immersing it in hot Sol-Klean and rinsing it in water. Sol-Klean is non-inflammable and no noxious or corrosive fumes are evolved.

Sol-Klean is easy to use and can be made an integral part of your production line.

Metal treating and cleaning chemicals for 25 years

INDUSTRIAL CHEMICAL PRODUCTS CO.

3775 BELLEVUE AVE. **DETROIT 7, MICH.**

Representatives in principal midwestern cities

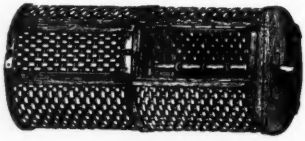
For Deburring, Cutting Down and high polishing of all types of metal parts use a Lupomatic

For efficiency in finishing metal parts, install a DEBURRMASTER.

Save time, money. Perfect results assured.

LUPOMATIC TUMBLING MACHINE CO., INC.
4510 BULLARD AVE. BRONX, N. Y.

Inexpensive, light in weight. Easy to install and operate.



King White-Oak Plating Barrel

becomes a sub-anode, thereby producing a cleaner, brighter plate. Less plating time is required to put on the desired thickness of plate.

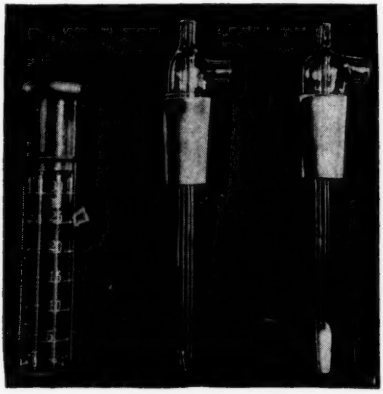
Send for catalogue and specification sheets.

JOHN KING 48 SPRINGFIELD ST. DAYTON 3, OHIO

M.S.A. All-Glass Midget Impinger Unit

An all-glass midget impinger unit for use in dust sampling has been developed by the Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa. Small, light, and compact, the impinger provides convenient portability with easy hand operation in surveying dust hazards.

The all-glass sampling unit consists of a flask and nozzle with a standard



M.S.A. All-Glass Midget Impinger Unit

taper ground-glass stopper. A fritted glass bubbler is also available. This equipment makes possible the sampling of a wide variety of dusts, gases, and vapors.

According to the manufacturer, the all-glass construction of the M. S. A. Impinger Unit permits easy and thorough cleaning and prevents contamination or discoloration of the sample undergoing tests. The air outlet in the unit is located at a maximum height, and the possibility of drawing over any of the collecting fluids is practically eliminated. The impinger nozzle orifice is fixed at the correct height and no readjustment is necessary. Each nozzle has been checked to assure a flow of within 4 per cent of 1/10 cubic foot per minute at 12-inch water vacuum, it is claimed.

The M. S. A. All-Glass Midget Impinger Unit is obtainable in a sturdy leatherette case holding nine flasks and nozzles.

Now—MATCH THEIR BEST WITH YOUR MOST IN THE VICTORY LOAN!

Top off your good work on your Payroll Savings Plan with an outstanding showing in the Victory Loan—our last all-out effort!

Back the Victory Loan to help bring our boys back—and give our wounded heroes the best medical care. You know your quota! You also know by past war-loan experience that your personal effort and plant solicitation are required to make your quota!

Sell the New F. D. Roosevelt Memorial $200 Bond through your PAYROLL SAVINGS PLAN!

In rallies, interdepartmental contests, and solicitations, promote the new Franklin Delano Roosevelt Memorial $200 Bond! Better than "cash in hand," Victory Bonds enable buyers to build for the future!

Keep on giving YOUR MOST to the Victory Loan! All Bond payroll deductions during November and December will be credited to your quota. Every Victory Bond is a "Thank You" to our battle-weary men! Get behind the Victory Loan to promote peacetime prosperity for our returning veterans, your nation, your employees—and your own industry!

The Treasury Department acknowledges with appreciation the publication of this message by

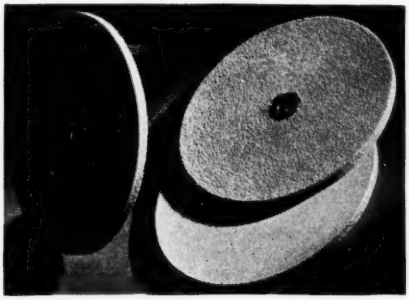
PRODUCTS FINISHING

This is an official U. S. Treasury advertisement prepared under auspices of the Treasury Department and War Advertising Council

Duplex Refacing Stone for Taber Abraser Calibrase Wheels

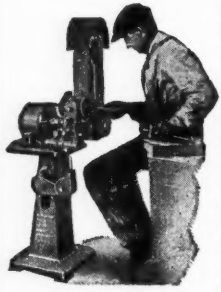
The Taber Instrument Corp., 111PF Goundry St., North Tonawanda, N. Y., announces a Duplex Refacing Stone for the Calibrase wheels used in the Taber Abraser—a testing instrument for determining the rate of wear or abrasion resistance of a wide range of materials. The wearing action is performed by dual Calibrase wheels bearing against the specimen under constant pressure and revolving in opposite directions, one sliding radially toward the outside and the other sliding toward the inside of the wear path. To maintain a uniform wearing action, the Calibrase wheels should be refaced at stated intervals. Abrasive coated paper discs formerly used for this purpose are now being replaced by the Duplex Refacing Stone illustrated herewith.

One side of the stone is a coarse grit for refacing the wheels at the start of a test and the other side is a fine grit used at intervals during a test. The advantage claimed by the manufacturer for the Duplex Refacing Stone is improved control of the Calibrase wheel surfaces by eliminating or minimizing the possibility of picking up additional grit, thus assuring standardization of the wheels. The Duplex Refacing Stone is also said to be more economical since its wear life is claimed to be considerably longer than that of the former abrasive coated paper discs.



Duplex Refacing Stone for Taber Abraser Calibrase Wheels

BUFFER • POLISHER
SURFACER
Centerless
"Production" Type S



This machine combines a centerless feed polishing machine with a vertical or horizontal belt grinder, surfacer, polisher or buffer for both cylindrical and flat work. Can be used for anything that can be ground or polished—metals, rubber, fibre, wood, etc.

PRODUCTION MACHINE CO.
GREENFIELD MASS.

CUT DOWN REJECTS
WITH
ORVUS
IN YOUR METAL CLEANING BATHS
This sulfated fatty alcohol Cleansing Agent is EFFECTIVE
—as a surface tension lowering agent
—as an emulsifier
—in dispersing lime soaps which might cause poor plating results if permitted to deposit on the metal
Write for further information about Orvus to
PROCTER & GAMBLE, Cincinnati, Ohio

Ballou's Metal Finishes

Will improve the appearance of your products and duplicate closely real plated finishes—

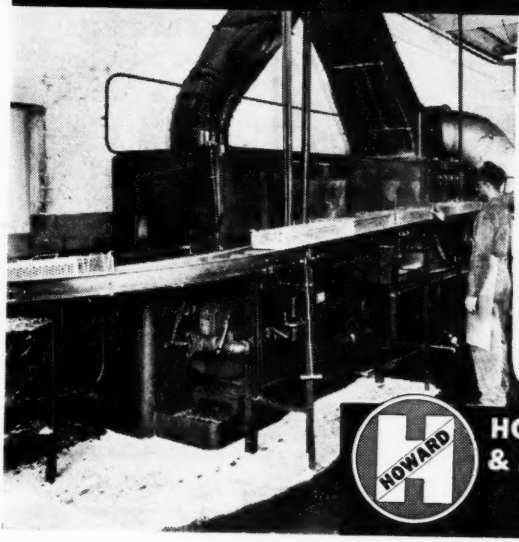
- **Super Bright Gold Bronze Powders**
- **Super Bright Copper Bronze Powders**
- **Chrome Aluminum Paint**
- **Chrome Aluminum Paste**

Send for samples and prices.

EDWARD C. BALLOU CO.

6 VARICK STREET **NEW YORK 13, N. Y.**

HOWARD Conveyor Washer



CLEANING PRECISION SCREW MACHINE PARTS for the DEUTSCH CO.

This Howard Conveyor Wash machine was specially designed to fit in with the production set-up of this noted firm. Howard can build machines to meet your requirements as efficiently.

Write for catalog and detailed information.

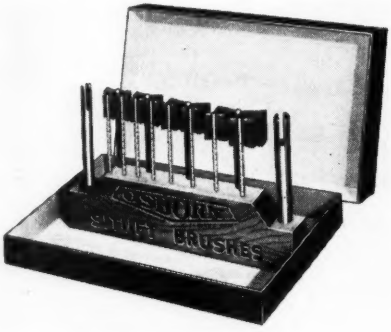
Machinery for Pickling • Tumbling Deburring • Washing • Quenching Drying • Burnishing

HOWARD ENGINEERING & MANUFACTURING CO.

2237 BUCK STREET
CINCINNATI 14, OHIO

Osborn "Situft" Power Brush

Designed to speed production processes, a power brush to be known as the "Situft" has been developed by The Osborn



Osborn "Situft" Power Brush Kit

manufacturing Co., 5401 Hamilton Ave., Cleveland, Ohio. Utilizing a new principle of wire suspension under pressure and available with a variety of holding tools designed for use in drill presses, bench grinders, and other special production and deburring tools, the brush is made with high grade crimped wire and can be obtained in a wide variety of sizes.

Outside diameters range from ¼ to 1¼ inches, brush face lengths from $\frac{9}{16}$ to ⅝ inch, stem sizes to fit $\frac{1}{16}$, $\frac{3}{32}$, and ⅛-inch chucks, overall lengths from 2⅛ to 2¼ inches, and the gauge of wire used from 0.003 to 0.005 inch. Shipping weight ranges from 2 to 4½ oz. An attractive kit containing 12 different sizes of Situfts and two sizes of special holders can be furnished. The kit features a block which holds the brushes and holders in place according to size.

The Osborn Situft Power Brush can be used for removing insulation, rust, mold marks, and for a large number of operations involving the deburring, cleaning, or finishing of small diameter inside surfaces. One of the convenient holders designed for many production operations is constructed to fit into the standard ¼-inch air chuck of portable tools, and an easy method has been devised for inserting or removing the brush from holders with special pliers.

ROLOCK

PROCESSING CARRIERS

Centrifugal Galvanizing Baskets take a tremendous beating from the rapid whirling that spins off the excess zinc after dipping. Rolock custom-built this steel basket with design and strength to give the utmost service life... at lower costs. Ask Rolock engineers for baskets, crates, trays, racks or fixtures specially designed to best suit your finishing processes. Capacities to 4 tons . . . any material. *Send for catalog.*

ROLOCK, INC.

1400 Kings Highway East, Fairfield, Conn

Hammond of KALAMAZOO

"400"

4" ABRASIVE BELT GRINDER

Eliminate costly hand filing, grinding, deburring and many other operations . . . There are "101" applications for the 400 in your plant. Write for bulletin.

Hammond Machinery Builders

1622 DOUGLAS AVE., KALAMAZOO 54, MICHIGAN

Having Trouble Removing the Paint?

USE FIDELITY

Stripping Compounds

Her "paint" has been on for only a few hours and yet she's having trouble removing it. In contrast, the coatings of paint that you run into may have been on for many years. To get them off, you must use efficient stripping compounds — materials that dig in and get right down to the surface of the bare metal.

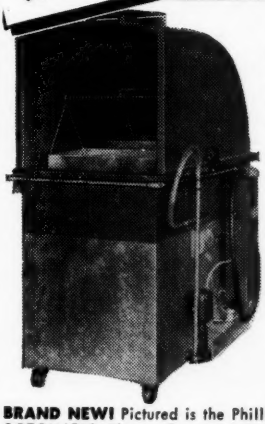
The Fidelity label on such compounds is a guarantee of dependability and satisfactory performance. Write or phone us your stripping and cleaning requirements.

FIDELITY CHEMICAL PRODUCTS CORP. 430 RIVERSIDE AVE. NEWARK 4, N. J. HUmbolt 3-3640

"Serving industry with cleaning and stripping compounds"

No Reconversion Worry Here!

PHILLIPS VAPOR DEGREASERS SPEED PRODUCTION QUOTAS



PHILLIPS VAPOR DEGREASERS clean ferrous or non-ferrous metals without pitting, scoring, or etching. Lowest toxicity, high efficiency, non-inflammable PHILLSOLV, used with a Phillips Vapor Degreaser, cleans 60 per cent faster—better—safer.

Phillips Vapor Degreasers are engineered in a wide range of needed sizes from portables up to mammoth heavy-duty conveyor degreasers handling 14,600 pounds per hour.

THE ONLY ALL-ELECTRIC DEGREASING MACHINE THAT RECLAIMS ITS OWN SOLVENT!

Phillips Vapor Degreaser reclaims its own solvent while the machine is in operation . . . no need to shut down for distilling!

Distributors in All Principal Cities.

Send for FREE Degreasing Manual — We make power spray washers, surge washers, stripping and dip tanks...a complete line of metal cleaning machinery.

BRAND NEW! Pictured is the Phillips ROTOMATIC Vapor Degreaser...conveyorized performance at open degreaser cost. Write for details.

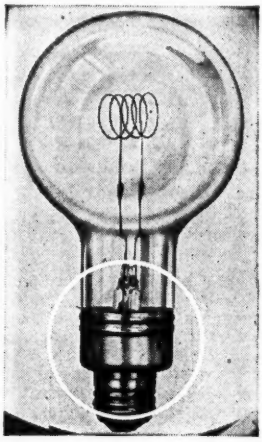
PHILLIPS MANUFACTURING CO.

3440 W. TOUHY AVE. • CHICAGO 45, ILL.

Nalco Infra-Red Drying Lamp with Mechanical Screw Base

The North American Electric Lamp Co., 1014 Tyler St., St. Louis 6, Mo., announces that its Nalco Carbon Filament Infra-Red Drying Lamp is now being supplied with a mechanical joint between the base and the bulb to provide a permanent seal under all conditions. This method of mechanically locking the base to the bulb is said to eliminate the need for cements or other binders and to assure maximum lamp life even under the terrific heat of infra-red tunnel installations.

The clear type lamp is furnished with the mechanical base in 128, 250, 375, and 500 watts. The inside silvered R-40 lamp with mechanical base is available in 128, 250, and 375 watts.



Nalco Infra-Red Drying Lamp with Mechanical Screw Base

ALLWOOD

"Vienna Brand" Lime

Made from Limestone that is identical in chemical analysis and geological structure with European Imported Lime. Tests show a "lime cake" made from Allwood "Vienna Brand" Lime equals the finish made from imported lime.

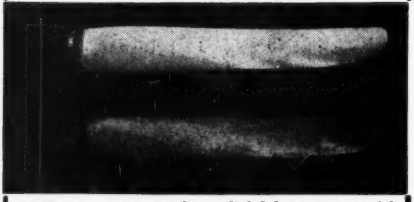
WRITE FOR FULL PARTICULARS

ALLWOOD LIME COMPANY

Manitowoc : Wisconsin

HIGH LUSTRE

For Stainless Steels



"You see the Difference"

4A

POLISHING COMPOUNDS

Produce that extra value in a beautiful finish — are known for economical cutting, cut and color and mirror finishing on all kinds of steel including stainless and carbon steels and hard-to-buff alloys.

SAMPLES ON REQUEST

HARRISON & COMPANY

HAVERHILL, MASSACHUSETTS

Polishing Compounds

Coloring Rouges—4A Cement and Thinner

Arco "Synox" Enamels

Known as "Synox," a group of all-synthetic hi-bake enamels that are said to provide unusually hard, stainproof finishes which are designed to endure heavy household usage has been developed by The Arco Co., 7301 Bessemer Ave., Cleve-

INVESTIGATE . . .

"BLAXITE"

RAPID BLACK OXIDE FINISHES

for

STEEL — ZINC — BRASS

THE TOBLER CHEMICAL CO.

28 OLIVER ST., BOSTON

When you see this Brand

U.S.A.D.

on Felt Wheels

you have the best that money can buy. Since 1896 we have specialized in the manufacture of Felt Wheels and Sheet Felts so this experience has enabled us to make felt that stands up on the job and gives greater production.

One test will prove the value of our products.

Send for our latest catalogue.

EASTERN FELT COMPANY

Manufacturers

80 CANAL ST., WINCHESTER, MASS.

FASTER CUTTING AND POLISHING

with

ALUM-O-PASTE

ALUM-O-PASTE is a composition of Aluminum Oxide with a special binder.

Aluminum Oxide being an artificial abrasive, manufactured under controlled conditions, uniform sharp grains in many degrees of hardness and physical characteristics are possible.

ALUM-O-PASTE will function in the same dependable manner always, assuring you of the desired results.

ALUM-O-PASTE is obtainable in grit sizes of 100, 120, 150, 180, 200, 240 and finer.

Send for your trial sample.

ROBERTS ROUGE CO.
STRATFORD • CONN.

land, Ohio. The enamels are being produced in several whites, one type being designed for refrigerators, deep freeze units, stoves, ironers, and electric mixers and another for dishwashers and washing machines.

According to the manufacturer, Arco Synox Enamels possess an unusual degree of water and alkali resistance and stain resistance, as well as exceptional color retention. They are said to resist normal fruit acids, vinegar, and so on, and to be unaffected by dilute or concentrated alkaline solutions. In addition, the enamels are claimed to resist the action of hot soapy solutions without dulling or excessive softening or embrittlement and to possess unusual abrasion resistance and low water retention.

Synox Enamels can be successfully applied to clean steel, with or without primer, and to aluminum and magnesium. Despite their extreme hardness, the enamels are said to possess a flexibility which is more than ample to meet all service conditions. Wide variations in the temperature and time cycle used in baking Synox produce no detectable difference in the color, film strength, and abrasion resistance of the finish, the manufacturer states.

Opportunity Section

DISTRICT REPRESENTATIVES WANTED:

To represent a Southern manufacturer of phosphate processing materials, pickles, acid and alkali cleaners for cleaning, conditioning, rust proofing and as a paint bond on metals prior to finishing. Technical staff of engineers and laboratories maintained for use of manufacturers to assure highest performance and to assist sales representatives. Quicker delivery of materials and less freight permitting lower delivered prices for Southern manufacturers. Write us giving qualifications. Representatives wanted in territory centering around Dallas or Houston, New Orleans, Memphis, Chattanooga, Louisville, Richmond and Jacksonville. Write Box No. 117, in care of Products Finishing, 431 Main St., Cincinnati 2, Ohio.

Willson "FeatherSpec" Eye Shield

Weighing less than 1 oz., a plastic eye shield for use in the performance of semi-hazardous operations such as light grinding, spot-welding, and other operations

Willson "FeatherSpec" Eye Shield

has been developed by Willson Products, Inc., Second and Washington Sts., Reading, Pa. Known as the "FeatherSpec," the shield features a one-piece plastic lens which is firmly held in a suspension-lock frame but is readily interchangeable or replaceable. A slight pull releases the lens from the grooved metal frame and makes it possible to substitute a green lens for a clear lens if the work involves glare.

According to the manufacturer, the Willson FeatherSpec Eye Shield can be worn over special prescription lenses with complete comfort and affords added protection to those workers who wear glasses. Only one size is said to be required to fit any type of face as a result of the unique design of the nose rest which is a part of the lens.

Optimus Solvent No. 2

Designated as Optimus Solvent No. 2, a carefully blended mixture which, when mixed in kerosene or other hydrocarbon diluent, is said to remove soil from work by solvent cleaning action is announced by the Optimus Detergents

Co., 132 Church St., Matawan, New Jersey.

Described as non-toxic, non-irritant, stable, and long lasting, Optimus Solvent No. 2 can be used in a kerosene and water emulsion. According to the manufacturer, a water rinse readily emulsifies Optimus Solvent No. 2 and kerosene mixtures to yield physically clean surfaces suitable for further processing. Properly diluted with water, the solvent can also be used as a pre-soak prior to electro-cleaning to remove tripoli, rouge, and similar buffing compounds.

Udylite Automatic Plating Machine. A four-page folder illustrating and describing a compact fully automatic plating machine which is said to be adaptable to 80 per cent of all quantity plating jobs is now being distributed by The Udylite Corp., 1651 E. Grand Blvd., Detroit 11, Mich. Copy free upon request.

Electro-Plating. Fifth edition. By Samuel Field and A. Dudley Weill. Published by Pitman Publishing Corp., 2 W. 45th St., New York 19, N. Y. 483 pages. Illustrations and tables. Cloth binding, board covers. Price, $5.00.

This edition represents a revised and enlarged work over the previous editions on the subject and contains reference to the newer methods that have been introduced into the science and art of electrodeposition which has now found so wide application in engineering and industry generally.

Comprising this volume is a total of 24 chapters which are headed as follows: Fundamental Principles—Chemistry and Metallurgy; Electricity and Electrochemistry; Electrochemistry; Principles of Chemical Analysis of Electro-Depositing Solutions; Some Materials Used in Electro-Plating; Sources of Current; Properties of Electro-Depositing Solutions; Electro-Plating Plant; Mechanical Cleaning; Chemical Cleaning; Deposition of Copper: The Acid Bath; Deposition of Copper: Alkaline Baths; Deposition of Silver; Deposition of Gold; Deposition of Nickel; Deposition of Nickel (Cont'd); Deposition of Zinc; Deposition of Cadmium; Deposition of Chromium; Deposition of Various Metals; Deposition of Alloys; Testing of Electrodeposits; Allied Processes; and Metal Colouring. In addition, the book includes an appendix and index at the rear.

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